

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ASMR	Age-Specific Mortality Rate
COPD	Chronic Obstructive Pulmonary Disease
CVD	Cardiovascular Diseases
CIS	Commonwealth of Independent States
DNA	Deoxyribonucleic acid
EU	European Union
GDP	Gross Domestic Product
ICD	International Classifications of Diseases
HIV	Human Immunodeficiency Virus
HPV	Human Papillomavirus
MDB	Mortality Database
MN	Malignant Neoplasms
NIS	New Independent States
PIN	Prostatic Intraepithelial Neoplasia
POM	Polycyclic Organic Matter
SDR	Standardised Death Rate
UNSCEAR	United Nations Scientific Committee on the Effects of Atomic Radiation
UV	Ultraviolet
USSR	Union of Soviet Socialist Republics
WHO	World Health Organization

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

LIST OF TABLES

<i>Tab. 1. List of selected countries, according to available years.....</i>	<i>36</i>
<i>Tab. 2 List of leading causes of death according to the revisions of the International Classification of Diseases</i>	<i>37</i>

LIST OF FIGURES

<i>Fig. 1. Immigration in the selected countries 1998-2008</i>	20
<i>Fig. 2. Emigration in the selected countries 1999-2008</i>	22
<i>Fig. 3. Number of children per woman in the selected countries</i>	23
<i>Fig. 4: Development of life expectancy at age 65, in 1986-2008, males</i>	24
<i>Fig. 5: Development of life expectancy at age 65, in 1986-2008, females</i>	24
<i>Fig. 6. Development of life expectancy at birth, Czech Republic</i>	41
<i>Fig. 7. Development of life expectancy at birth, France</i>	42
<i>Fig. 8. Development of life expectancy at birth, Hungary</i>	43
<i>Fig. 9. Development of life expectancy at birth, Italy</i>	44
<i>Fig. 10. Development of life expectancy at birth, Kazakhstan</i>	45
<i>Fig. 11. Development of life expectancy at birth, Norway</i>	46
<i>Fig. 12. Development of life expectancy at birth, Russia</i>	47
<i>Fig. 13. Development of life expectancy at birth, Sweden</i>	48
<i>Fig. 14. Decomposition of the Czech Republic-Sweden gap in life expectancy by age and main causes of death for males, 2006</i>	49
<i>Fig. 15. Decomposition of Kazakhstan-Sweden gap in life expectancy by age and main causes of death for males, 2006</i>	49
<i>Fig. 16. Decomposition of the Czech Republic-France gap in life expectancy by age and main causes of death for females, 2006</i>	50
<i>Fig. 17. Decomposition of Kazakhstan-France gap in life expectancy by age and main causes of death for females, 2006</i>	50
<i>Fig. 18. Age-standardised mortality rates by main causes of death of mortality levels in the selected countries for males, 2006</i>	51

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

<i>Fig. 19. Age-standardised mortality rates by main causes of death of mortality levels in the selected countries for females, 2006</i>	<i>52</i>
<i>Fig. 20. Age-standardised mortality rates by all causes of death in 1986-2008, males</i>	<i>53</i>
<i>Fig. 21. Age-standardised mortality rates by all causes of death in 1986-2008, females</i>	<i>53</i>
<i>Fig. 22. Age-standardised mortality rates by cause of death from infectious diseases in 1986-2008, males</i>	<i>54</i>
<i>Fig. 23. Age-standardised mortality rates by cause of death from infectious diseases in 1986-2008, females</i>	<i>54</i>
<i>Fig. 24. Age-standardised mortality rates by cause of death from neoplasm diseases in 1986-2008, males</i>	<i>55</i>
<i>Fig. 25. Age-standardised mortality rates by cause of death from neoplasm diseases in 1986-2008, females</i>	<i>55</i>
<i>Fig. 26. Age-standardised mortality rates by cause of death from circulatory diseases in 1986-2008, males</i>	<i>56</i>
<i>Fig. 27. Age-standardised mortality rates by cause of death from circulatory diseases in 1986-2008, females</i>	<i>56</i>
<i>Fig. 28. Age-standardised mortality rates by cause of death from respiratory diseases in 1986-2008, males</i>	<i>57</i>
<i>Fig. 29. Age-standardised mortality rates by cause of death from respiratory diseases in 1986-2008, females</i>	<i>57</i>
<i>Fig. 30. Age-standardised mortality rates by cause of death from digestive diseases in 1986-2008, males</i>	<i>58</i>
<i>Fig. 31. Age-standardised mortality rates by cause of death from digestive diseases in 1986-2008, females</i>	<i>58</i>
<i>Fig. 32. Age-standardised mortality rates by cause of death from external diseases in 1986-2008, males</i>	<i>59</i>
<i>Fig. 33. Age-standardised mortality rates by cause of death from external diseases in 1986-2008, females</i>	<i>59</i>
<i>Fig. 34. Age-standardised mortality rates by cause of death from others (residual) diseases in 1986-2008, males</i>	<i>60</i>
<i>Fig. 35. Age-standardised mortality rates by cause of death from others (residual) diseases in 1986-2008, females</i>	<i>60</i>
<i>Fig. 36. Number of deaths by main causes of death of mortality structure in the selected countries for males, 2006</i>	<i>61</i>

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

<i>Fig.37. Number of deaths by main causes of death of mortality structure in the selected countries for females, 2006.....</i>	<i>62</i>
<i>Fig. 38. Age-standardised mortality rates by malignant neoplasm of trachea, bronchus and lung in 1986-2008, males</i>	<i>65</i>
<i>Fig. 39. Age-standardised mortality rates by malignant neoplasm of trachea, bronchus and lung in 1986-2008, females</i>	<i>65</i>
<i>Fig. 40. Age-standardised mortality rates by malignant neoplasm of colon, rectum and anus in 1986-2008, males</i>	<i>66</i>
<i>Fig. 41. Age-standardised mortality rates by malignant neoplasm of colon, rectum and anus in 1986-2008, females</i>	<i>66</i>
<i>Fig. 42. Age-standardised mortality rates by malignant neoplasm of stomach in 1986-2008, males</i>	<i>67</i>
<i>Fig. 43. Age-standardised mortality rates by malignant neoplasm of stomach in 1986-2008, females</i>	<i>68</i>
<i>Fig. 44. Age-standardised mortality rates by malignant neoplasm of prostate in 1986-2008 .</i>	<i>69</i>
<i>Fig. 45. Age-standardised mortality rates by malignant neoplasm of female breast in 1986-2008.....</i>	<i>70</i>
<i>Fig. 46. Age-standardised mortality rates by malignant neoplasm of lymphatic and haemopoietic tissue in 1986-2008, males</i>	<i>71</i>
<i>Fig. 47. Age-standardised mortality rates by malignant neoplasm of lymphatic and haemopoietic tissue in 1986-2008, females</i>	<i>71</i>
<i>Fig. 48. Age-standardised mortality rates by malignant neoplasm of lip, oral cavity and pharynx in 1986-2008, males</i>	<i>72</i>
<i>Fig. 49. Age-standardised mortality rates by malignant neoplasm of lip, oral cavity and pharynx in 1986-2008, females.....</i>	<i>72</i>
<i>Fig. 50. Age-standardised mortality rates by malignant neoplasm of larynx in 1986-2008, males</i>	<i>73</i>
<i>Fig. 51. Age-standardised mortality rates by malignant neoplasm of larynx in 1986-2008, females</i>	<i>74</i>
<i>Fig. 52. Age-standardised mortality rates by malignant neoplasm of oesophagus in 1986-2008, males</i>	<i>75</i>
<i>Fig. 53. Age-standardised mortality rates by malignant neoplasm of oesophagus in 1986-2008, females</i>	<i>75</i>
<i>Fig. 54. Age-standardised mortality rates by other neoplasms in 1986-2008, males</i>	<i>76</i>
<i>Fig. 55. Age-standardised mortality rates by other neoplasms in 1986-2008, females.....</i>	<i>76</i>

CONTENTS

LIST OF ABBREVIATIONS	5
LIST OF TABLES	6
LIST OF FIGURES	7
CONTENTS.....	10
Chapter 1	12
Introduction.....	12
1.1 Problem definition.....	12
1.2 Research goals and objectives.....	14
1.3 Cognitive and practical relevance of the theme	14
1.4 Structure of the thesis.....	15
Chapter 2.....	16
Literature overview	16
2.1 Review of the literature.....	16
2.2 Description of the demographic situation in the selected countries.....	18
Chapter 3.....	25
Theoretical and empirical framework	25
3.1 Basic concepts and terminology.....	25
3.2 Relevant theories and facts.....	27
Chapter 4.....	31
Research questions and hypotheses	31
4.1 Research questions	31
4.2 Initial hypotheses	31

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Chapter 5.....	34
Data and methods.....	34
5.1 Data availability and quality	34
5.2 International classification of diseases	36
5.3 Adopted approaches and methods used	38
Chapter 6.....	41
Analysis of general mortality trends in the selected countries between the period of 1986-2008.....	41
6.1 Changes in life expectancy at birth among the selected countries	41
6.2 Decomposition of life expectancy at birth	49
Chapter 7.....	51
Analysis of mortality trends by main causes of death in the selected countries between the period of 1986-2008.....	51
Chapter 8.....	63
Analysis of mortality trends by major cancer sites in the selected countries between the period of 1986-2008.....	63
Chapter 9.....	77
Causes of cancer and policies for prevention.....	77
9.1 Key lifestyle risk factors for cancer	77
9.2 Proposal part – opportunities for cancer prevention	86
Conclusion	88
References.....	92
List of appendices	98

Chapter 1

Introduction

While starting thesis research I have crossed over the problems of identifying the main aims and objectives of my thesis, as well as the need of its further implementation. That is why my first step towards holding a research is define main problems of the thesis and the harmonogram for my future investigation.

Firstly, I have found out, that there is a lot of information about cancer deseases and mortality from cancer in the Internet and other available sources, but that information is kind of descriptiional, moreover including the personal meaning of its authors. My thesis will be objective and based on the relevant sources of information. There are no personal (subjective) judgements and opinions, but descriptive analysis of the current staff and my analysis of its development for the selected period (based on statistical information and analysis as well). Thus I can proclaim that this thesis is my own research combining already existed data and information about thesis, but completed and added with the practical analysis, calculations and graphic depiction.

Introduction part is one of the main parts of the thesis, as it defines further scheme of investigations. I have devided my introduction on several parts. In the first part of the thesis the basic analysis of the researched questions will be performed. There is given an overall introduction to the probematics. In the second part the goals and targets of the thesis are indentified. In the third part I will show subsequently the practical relevance of the work. Thus I have all of the necessary point: problem definition, research scheme and practical implementation of the following text.

1.1 Problem definition

Cancer deseases are commonly called as the “plague of the twentieth century”. Cancer causes many deaths, and it is not the problem of only aged people, but young patients and children as

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

well. The cruelty and fatality of this problem is that cancer is still not completely curable, there is no universal medicine or method how to eliminate it or to diminish this process.

The tendencies and prospects have been studied by a lot of scientists and professionals; various of methods have been created and patented and there are also measures how to prevent oneself from cancer diseases – however all of those methods are just pathetic. I can assume that medicine sciences and laboratory research have caused great improvement – now sick people can diagnostify this disease in its early stage, thus assure themselves from inevitable death, but still the procedures are optional, so not everybody may underdergo it and are aware of the disease when it is already too late...

In general we are able to say that cancer is the uncontrolled proliferation of any particular group of cells. If the cells start dividing and growing uncontrollably, there will be a failure of their DNA. As a result, cells are suppressed in the vicinity. Over time, these cells can penetrate into the bloodstream through which it spreads to other parts of the body. The body begins to lose nutrients and then its inventory will be depleted. In the final phase these uncontrolled spreading cells kill their individual. (Lecba-rakoviny.cz 2012).

Preventive action should constitute a significant part of clinical practice, which was carried out either on the individual patient or on the level of the whole company. Each of us will appreciate very much if we can avoid certain types of illness through the intervention of doctors, or they will be taken at such stage, which will not require difficult and burdensome treatment yet. A few important facts about cancer (World Health Organisation, 2004):

- Cancer is the second leading cause of death (adults have immediately after cardiac and vascular diseases, children have immediately after accidents).
- At present it is known that every third person in his live will fall ill with cancer.
- Between 5 and 70 year of life increases the risk of cancer in proportion to the age.
- Cancer is more common disease among men, and this is probably related to their lower immunity and riskier lifestyle.
- The most common influenced cause of cancer is nutrition, but now in the second place there is smoking.

The vast majority of cancer has certainly a genetic basis, which is manifested as a prerequisite for a particular type of cancer. This assumption may not occur in life at all, but often it occurs. This happens especially in a situation when this disease is combined with certain risk factors. (Lecba-rakoviny.cz 2012)

As time passes and oncological diseases are part of people everyday's life (as we hear about them in mass media, from our friends and members of the family), there have started several mass marches and activities which offer to everybody free diagnostics of the whole medical staff and elimination of cancer diseases at its beginning. I can give an example of "AVON march against breast cancer" (Zdravaprsa.cz 2012), charity activity "Movember against cancer" (Praha-tip.cz 2011) and other mass activities and charity actions. This shows on the actuality of the problem and the need of its solution via medicins, preliminary observations and

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008
 diagnosifications, but first of all, in the legal frame for all inhabitants of the Universe to make cancer preliminary maintenance visits obligatory, not optional.

1.2 Research goals and objectives

The goal of this thesis is to estimate the current cancer mortality rates in Kazakhstan, using the most accurate available cancer information, through detailed descriptive analysis of cancer mortality changes observed in comparison with some selected European countries, during the period 1986–2008. In order to achieve this, several objectives are summarized in this thesis:

- to analyse all-cause mortality patterns in Kazakhstan including their cause-of-death components in comparison with some selected European countries;
- to discuss an investigation of the quality of the different cancer mortality data sets, and in particular, how representative they are of the overall Kazakh population;
- to describe a review of cancer mortality time trends, including differences in trends by sex, age group, site and speculating on the possible reasons;
- to analyse the estimation of standardised mortality rates of different cancer sites.

1.3 Cognitive and practical relevance of the theme

Studies on cancer mortality have been conducted for almost all of European countries, also a few for Kazakhstan. Notably after Kazakhstan got independence in 1991, differences among countries of USSR, one of them being Kazakhstan, were not compared to European countries.

Within Europe there is not only a cancer mortality gradient between the East and West, but also between the North and South. Mortality, caused by some specific malignant neoplasm in Kazakhstan is in the highest level among selected European countries. Not only is life expectancy low, but also other demographic factors showing unfavorable trends.

Analysis of cancer mortality in Kazakhstan is of specific scientific interest. First of all, since taking independence Kazakhstan has undergone an enormous socio-economic transition and has also experienced an important change in mortality. In general, the mortality gap between Kazakhstan and some selected European countries has diminished in specific death rates. Second, it is worth examining why Kazakhstan is on the lower end of the range among the mentioned countries. Surprisingly little research has been devoted to this topic recently. This study aims to fill this gap.

The scientific novelty of this thesis and its theme is given by the above-mentioned fact that in depth analysis of cancer mortality development in Kazakhstan is almost completely missing in scientific literature. Several aspects of cancer mortality analysis presented in this thesis are very probably studied and presented for the first time in the given spatial and historical framework.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

1.4 Structure of the thesis

After discovering of all mentioned problems and hypothesis I have created a relevant structure for my master thesis. First part is a theoretical part – here I carry out literary research of the topic trying to find the most relevant and appropriate literature (books, monographies, articles and chapters) of the cancer problematic in the world, particularly in the member states and in Kazakhstan. Primarily those are statistical and demographical reviews which are described in the text below. It is necessary to start with demographic chapter as it describes the “content” of the particular states and main tendencies in the recent years (migration, people movements etc.).

After discovering the main topic and its theoretical background it is necessary to underline this theory with practice and analysis. Thus the second part of the thesis is dedicated to practical implementation, charts presentation and description of statistical analysis.

The conclusion part is a final outcome of the whole research. Conclusion includes not only findings, but general proposal for prevention of those terrible diseases.

Chapter 2

Literature overview

2.1 Review of the literature

Europeans today enjoy healthier, wealthier and longer lives than ever, a great achievement of our societies. However, policy-makers are still facing major health challenges, such as widening health gaps between and within member states, ageing of the population and increasing levels of chronic disease, including cancer.

Cancer, this complex group of diseases with serious implications not just for individuals and their families, but also for society in general and health systems in particular, remains an important health challenge in Kazakhstan, in Europe and world-wide.

At present, with more than 3 million new cases and 1.7 million deaths each year, cancer represents the second most important cause of death and morbidity in Europe. If these data are linked to the data on the projection of the burden caused by other non-communicable chronic diseases and to the data on the ageing of the European population, the problem is seen to be even greater. Without effective interventions, the cancer burden will increase dramatically, but comprehensive cancer prevention and control policies can bring significant benefits. (Global health risks 2011)

The text above shows the scale of the problem, which must have reflection in the scientific and literature world, describing different aspects of cancer diseases, psychological, sociological and demographical impact on one's life.

Unfavorable mortality trends in the former Soviet republics have attracted the attention of many researchers. The increase in mortality observed in the former USSR, and, after its collapse, in the New Independent States (NIS), represents a trend that is unprecedented in peacetime, and has thus stimulated extensive research. As a result, several kinds of explanations for the recent mortality crisis have been proposed, each tending to complement rather than contradict the others.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

The most straightforward, widespread, and well documented of them is that excessive alcohol consumption has had a strong influence on life expectancy at birth (Anderson and Silver 1990; Mesle' et al. 1992; Shkolnikov and Nemtsov 1997; Shkolnikov et al. 1998). Alcohol is known to be directly associated not only with violent mortality, but also with other causes of death. Research has demonstrated that heavy alcohol consumption has been an important determinant of cardiovascular mortality in the region (McKee and Britton 1998; Malyutina et al. 2002).

However, while alcohol plays an important role as both an immediate and an intermediate mortality determinant, it is far from being the only driver of the recent health crisis.

There are additional explanations linked to the abrupt political changes that triggered a very severe socioeconomic crisis (Mesle' et al. 2000, 2003). Unemployment growth, the erosion of the social security system and of the health sector, falling living standards, and growing income inequality are viewed as determinants of psychological stress and unhealthy behavioral patterns, which in turn have a negative impact on the health status of the population (Bobak et al. 2000; Cockerham et al. 2006; Cornia and Panizza 2000).

Other theories regarding the mortality crisis, such as declining standards of medical care and changes in dietary habits, have not received substantial support (Brainerd and Cutler 2005). Furthermore, the recent negative mortality dynamics cannot be fully attributed to the above-mentioned factors only.

First, the health crisis in the former Soviet republics is known to be the long-standing; it emerged well before the collapse of the USSR (Eberstadt 1981; Feshbach 1984; McKee 2006).

Until the early 1960s, life expectancy at birth in the USSR was growing and catching up with that of the Western world. The Soviet health care system was very successful in combating infectious diseases, but less effective against non-communicable diseases. In particular, unlike Western countries, the Soviet Union failed to benefit from the 'cardiovascular revolution' (i.e., the steady reduction in cardiovascular mortality, which was unanticipated and revolutionary from the viewpoint of the classical theory of epidemiologic transition; Omran 1971).

In the mid-1960s, cardiovascular diseases became the major cause of death, and mortality from accidents and other external causes was unusually high. From that time onwards, the USSR experienced a dramatic reversal on the path toward declining mortality, a trend which was especially pronounced in working-age men. Second, mortality trends in the early 1990s might have still been affected by the inverse effect of the anti-alcohol campaign launched by the Soviet government in 1985.

To sum up, the literature suggests that the mortality trends in the region seem to be influenced by the interplay of three major factors: the long-standing health crisis that began in the USSR several decades ago, the effects of the anti-alcohol campaign, and the socioeconomic and political changes that emerged with the dissolution of the USSR.

Our study focuses on the divergence in the recent mortality trends in the countries of the European Union in comparison with Kazakhstan and the Russian Federation as a country of the

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

former USSR. To explore the potential mechanisms of such a divergence, we purposely selected very contrasting cases in terms of the recent socioeconomic and demographic developments.

Before the dissolution of the Soviet Union, Kazakhstan and the Russian Federation were quite comparable in terms of economic performance and living standards. Despite some differences in overall mortality levels, they were also very close to each other in terms of directions of mortality trends and age-specific and cause-specific mortality patterns. After 1991, Kazakhstan and the Russian Federation experienced substantial political and social transformations, and faced multiple challenges associated with the transition from a socialist to a market economy system.

The sudden changes brought numerous problems, such as unemployment, falling living standards, a rise in poverty, and socioeconomic differentiation. These factors contributed to the significant deterioration in the already poor health situation (Cockerham 1997), but their magnitude and impact on the mortality crisis differed from country to country.

2.2 Description of the demographic situation in the selected countries

Figure 1 (see below) shows to us immigration of people to 8 countries in period from 1998 till 2008. The highest immigration during those 10 years was to Italy. Not dynamically developing high-tech sector generates massive outflow of intellectual capital of Italy. Young scientists, high school graduates leave the country in search of opportunities to continue the scientific activities in more favorable terms.

It should be noted that the level of immigration and post-graduate students is much higher than the national average. At the same time in Italy, a flood of migrants from developing countries. The geographical position of Italy is that it is located on the southern border of Europe, which leads to relatively high levels of migration from African countries. Also, the influx of immigrants comes from Asia, particularly China.

Immigrants from these regions are willing to work for lower wages than the indigenous population. This raises the issue of displacement of the indigenous population of cheap foreign labor. A significant portion of foreigners arriving in the country illegally overstates the official statistics on unemployment.

At the same figure we can see that the smallest amount of immigrants coming to France. The convenient geographical location, the presence of many international flights of air, sea, and rail and road modes of transport, a high standard of living in France is attractive to immigrants from Asia and the Middle East, Africa and European countries with unstable ethno-political situation, or have difficulty economic nature, including the Russian Federation, other CIS and Baltic republics.

As a result, while other countries are characterized by high birth rates and emigration, France has been for over 150 years of hosting foreigners, thus striving to resist the natural

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

decline of its population. Indeed, many experts agree that France needed immigrants. Another four countries which were mentioned in the figure 1 have stable level of immigration around 50 000 people per year.

The dynamics of inter-republic and international migration has tended to picking up the Kazakh ethnic group in the country of the same name and the return of other ethnic groups more often in place of the original release. There was a reduction of immigration flows to Kazakhstan and the intensification of the outflow of population from Kazakhstan. Some growth of repatriates was observed in Kazakhstan in 2004-2005 by Kazakhs from abroad - from Mongolia, China, Iran and Afghanistan (Asylbekov and Kozina 1995).

The main immigration flows to Kazakhstan were immigrants from Russia, Uzbekistan, Turkmenistan and Kyrgyzstan. Gained considerable scale and illegal immigration. Although the law restricts the import of Kazakh workers in Kazakhstan, the scale of illegal labor is enormous. The main flow of illegal workers is coming from Uzbekistan, Kyrgyzstan and Tajikistan. Cotton, tobacco, and other technical labor-intensive crops in the present scale, construction and material handling are ensured due to the influx of cheap foreign labor.

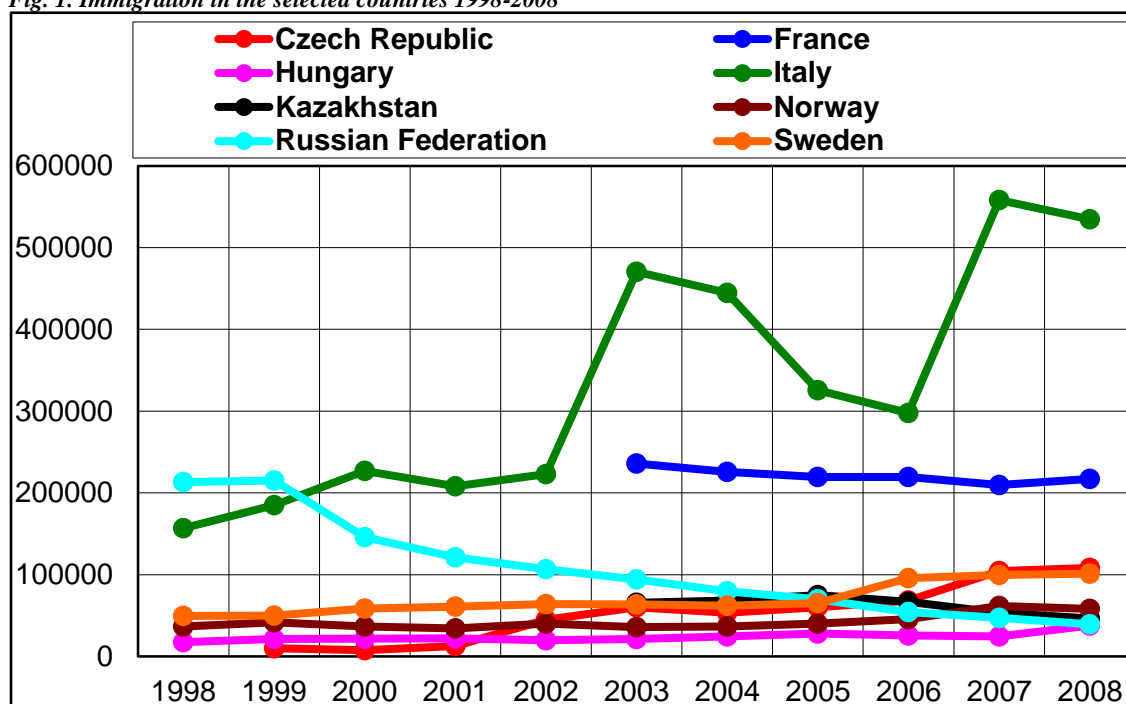
The mass deportations of illegal immigrants from Kazakhstan have not led to a marked increase in local employment. This involvement in the sectors with "dirty" technology, heavy physical manual labor monotonous seasonal workers from neighboring countries. Free hire cheap labor, not only releases of these areas, local workers, but also contributes to the acceleration of urbanization in rural areas (Asylbekov and Kozina 1995).

There is a spillover of the local workforce in the industrial sector, in education, science, and qualified domestic service, information technology and creative niche. Part of the rural youth is leaving to study in the city. There is a serious expansion of migration from Uzbekistan, Tajikistan and Kyrgyzstan to Kazakhstan, can seriously deteriorate the quality of labor, social and hygienic environment, and crime.

If in the first half of the 1990s among the illegal immigrants dominated the citizens of China, in the second half of the 1990s - the citizens of Turkey. In 1999-2000, marked by particularly sharp rise in illegal immigration (transit) from Afghanistan and Sri Lanka, which was associated with a worsening political situation in these countries. Difficulties experienced adaptation and refugees who came from the "hot spots". Accounting for those wishing to take an official status, leads Agency for Migration and demography. In 2001, Kazakhstan was officially registered more than 900 refugees; the real figure is around 20,000 (Kozina 2000).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 1. Immigration in the selected countries 1998-2008



Source: Author's own calculations based on data EUROSTAT database

Figure 2 shows emigration rates of 8 countries from 1999 till 2008 year. Values are in thousands of people. According to that figure the most high emigration trend shows Russia. Emigration of people started from 1999 year, it can be suggested because of unstable economical situation of country and monetary default in 1998. This process is accompanied by the flows of the capital and assets from the Russian Federation, and thus the inhabitants moved to the places they invested to or they were associating their economic life.

From 2004 we can see the sharp rise of emigration rate. At 2007 seemed very small flow of emigration. Looking to other countries: Sweden, Italy, Hungary, Norway; we can see a stable emigration rate of people. This amount is about 70 000 people per year. Probably it can be explained by favorable economic prosperity. On the figure 2 we can see that emigration line of France is different from other European countries.

Emigration is started at 2003 and was higher than in other describing countries. The last country which is described on that graph is Kazakhstan. According to graph we can see that emigration in Kazakhstan started at 2003 and was going a little bit lower till 2006 and than it returned to the same level. Since 1991, the population is constantly decreasing due to declining fertility, reduction in life expectancy at birth, particularly among men, and emigration (Kozina 2000).

The flow of emigration has decreased from 309.632 persons in 2001 to 65.785 in 2004 with the same direction as the movement of immigrants - other CIS countries, especially the Russian Federation (66.6%) as the destination. Moreover, the main outflow of the population comes from the regions bordering with Russia (Eurostat 2011).

Basically, leave and living the urban population, as determined by the following factors (Kozina 2000):

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

- City dwellers have higher qualifications and it is easier to get a job in another country.
- In the village live mostly people of Kazakh nationality. To migrate to Russia or to other countries it is more complicated.
- The village is much poorer than the city on the move requires considerable resources.
- The migration processes that have been taken place, and having in Kazakhstan, had their impact on the demographic situation in the country.
- Emigration from Kazakhstan is different. This is actually irreversible "brain drain and qualifications". Much of the emigrants are trained staffs, who are leaving with families forever.

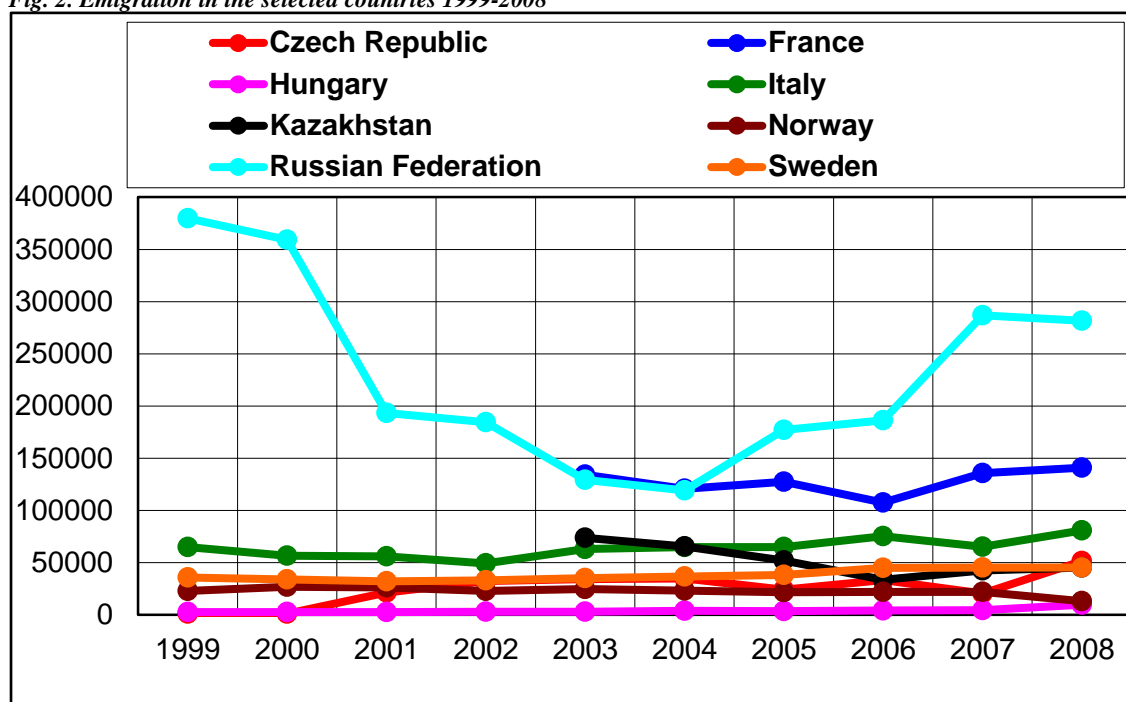
Another stream of emigration is young people, departing to study in Russia. This stream is not defined ethnic groups. According to a survey in the border regions with Russia, many children learn in high schools in Omsk, Novosibirsk, and Tomsk.

The probability of their return to Kazakhstan is extremely low. It is possible that emigration to the study may not register with the state authorities, as those who leave are not officially required to declare to anyone about leaving. Currently, immigration sentiment Slavic ethnic group again increased. This is due to several factors. (Kozina 2000):

- Revolution at the nearest neighbor - Kyrgyzstan;
- May conflict of opposition and young people in Chimkent;
- Persistent, albeit slow implementation of the official language in administrative procedures;
- Having grown up home prices in the major cities, which allow you to purchase accommodation in Russia by selling available in Kazakhstan.
- It is possible that the outflow skilled manpower from Kazakhstan will continue.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 2. Emigration in the selected countries 1999-2008



Sources: Author's own calculations based on data from EUROSTAT database

This item represented fertility is an average number of births per woman of reproductive age. The fertility rate is a more accurate indicator of fertility than the crude birth rate. This ratio indicates a potential change in the structure of the population in the country. The fertility rate two children per woman are considered as the breeding ratio. The fertility rate for more than two children per woman contributes to the growth of the population, while the median age is lowered.

An even greater fertility rate indicates that parents may have problems with how to feed and educate their children, and women may appear difficulties with access to work. The fertility rate less than two children per woman help to reduce the number of population and it's aging. Globally, fertility rates decline. Most of these trends can be seen in industrialized countries, particularly in Western Europe, where in the next 50 years a sharp reduction in the population is not anticipated.

Parents prefer to have less children, if the overall quality of life improves and they do not have to be afraid of high infant mortality. It should be noted that the rapid decrease in fertility may not lead to lower birth rates in the country, if the composition of the population, the proportion of young families. Countries with high-income population growth are even slower.

For today's developed countries are characterized by the so-called aging of the population. As a result of low fertility in these countries, combined with a paradoxical at first sight, is an increase in mortality. In developed countries such as Germany and Italy, these trends have led to an absolute reduction in population due to its "natural wastage". In the future, demographers expect the spread of the situation in other developed countries.

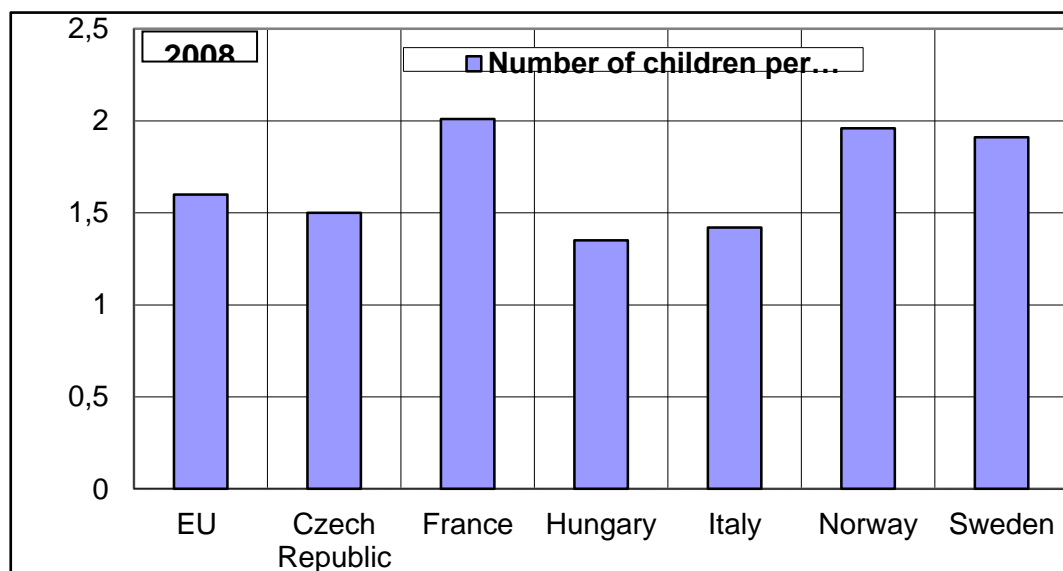
The birth rate in European countries with economies in transition over the past 5-10 years has fallen sharply. And the reasons for rapid fertility decline, in these countries, are different

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

from the reasons for acting in most developing countries: most likely they belong to the so-called social costs of transition. As a result, in Russia, for example, the level of fertility, it is an indicator of the number of children per average per woman, fell far below the "normal recovery" (a little more than two children per family), and below its rate in most developed countries.

In 2009 total (births per woman) in Kazakhstan was 2.60, according to a World Bank report, published in 2010.

Fig. 3. Number of children per woman in the selected countries



Sources: Author's own calculations based on data from EUROSTAT database

On the predication of the World Health Organization after 60 years of old age begins. The elderly, mind you, but not senile. Here in the figure 4, 5 we will show the rate of life expectancy after 65 years, on period of retirement age.

Over the past five decades in the European Union both women and men about 10 years, increased life expectancy at birth. By 2008 it reached 82.4 years and 76.4 years respectively. Increased life expectancy has occurred in all EU countries. In 2008, the largest women's life expectancy at birth was observed in France (84.8), Italy (84.2 according to 2007) and Sweden (83.2) in men - in Sweden (79.1), Italy (78.7 - according to 2007), and the Czech Republic (74.1).

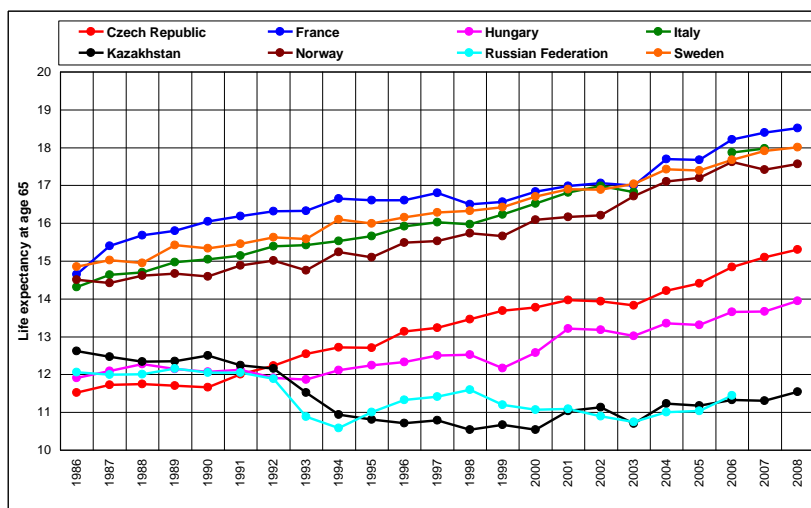
Upon reaching the age of 65 EU women can expect another 20.7 years, survival, men - 17.2 years. As life expectancy at birth for the period 1999 – 2008, life expectancy of 65 years also increased in all EU countries. The largest of its growth for both women (23.0) and men (18.5) was recorded in France.

Scientists have analyzed the performance in the EU and in Russia and came to the conclusion that as a cause of premature death, comparable only to infectious diseases and cancer, although of them in Russia die more often, but not significantly. Around the same time most Russians have become victims of poisoning, crime and traffic accidents. The probability of being killed in Russia is 20 times higher than in EU countries.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Today Kazakhstan and EU countries are confronted with complex demographic problems. Europeans began to live much further due to the good health and quality of life. However, simultaneously with the increase in life expectancy is reduced fertility in Europe. This will inevitably lead to a reduction in the number of employees. In the future, society will not be able to provide the European retirees familiar, relatively high pensions.

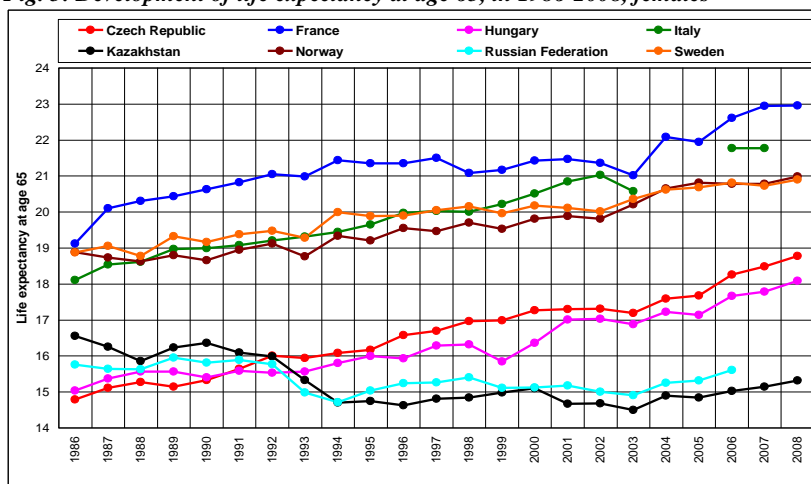
Fig. 4: Development of life expectancy at age 65, in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 5: Development of life expectancy at age 65, in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Data for Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Figure 4 and 5 show the average life expectancy of the male and female population over 65 years, supremely these countries during the period 1986-2008, respectively. On the base of that graph we can observe that on countries: Norway, Italy, Sweden, France life expectancy after 65 years clearly exceeds the life expectancy after 65 years of men at countries: Kazakhstan, Czech Republic, Hungary and Russia.

Chapter 3

Theoretical and empirical framework

3.1 Basic concepts and terminology

The used basic terms and concepts applied in thesis. Mortality is the condition or quality of being mortal; subjection to death or to the necessity of dying. (Webster 1913)

Life expectancy is the expected (in the statistical sense) number of years of life remaining at a given age.

Age standardized rate is defined as a method of adjusting the crude rate to eliminate the effect of differences in population age structures when comparing crude rates for different periods of time, different geographic areas and/or different population sub-groups (e.g. between one year and the next and/or States and Territories, Indigenous and non-Indigenous populations). Adjustments are usually undertaken for each of the comparison populations against a standard population (rather than adjusting one population to resemble another). Sometimes a comparison population is referred to as a study population.

Ageing index is calculated as the number of persons 60 years old or over per hundred persons under age 15.

The potential years of life lost (YPLL) for each death (usually to residents of a geographic area for a specific time period) are summed to represent the total years of potential life lost for that area.

Standard populations are “artificial populations” with fictitious age structures that are used in age standardization as uniform basis calculation of measures for the respective reference population.

Cancer can affect virtually any organ, but almost all types of malignancy share a common feature—the capacity of the cells to multiply without control, to spread to other organs (metastasise) and to kill the patient. The suffering of cancer patients and their families at an individual level is mirrored at the societal level, creating a huge burden for health services and the wider economy (Brown et al. 2001).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

But the term “cancer” is not used just once. There are a lot of kinds of cancer – more than 100, that is why this term is used for different diseases, but with same roots. In this case we are able to talk about cancer of stomach, mouth, lung, cancer of breast, sarcoma of bone, prostate, and Hodgkin disease, cancer of cervix, colon/rectum, non-Hodgkin lymphoma and leukemia. In all these diseases common is the failure of the mechanisms, which control and regulate normal growth of cells, its proliferation and its death.

According to statistics 65% of patients, who were given a diagnosis of cancer, are people of the elderly population of over 65 years. In 2008 of the 12.4 million of new cancer cases in the world, the most popular were lung cancer (1.52 million), breast cancer (1.29 million), and colorectal cancer (1.15 million).

It is very important to understand that 40% of all cancer cases it is possible to prevent in case of not smoking, eating a healthy diet and by taking physical exercise. The usage of tobacco is a very strong factor for everybody to possibility of having cancer in many different types of cancer such as: stomach, kidney, lung, and bladder, and throat, mouth, liver and pancreatic. Lung cancer is most of all the result of active or passive smoking. But also there is another example of possibility to have lung cancer is an environmental tobacco smoke.

The same catastrophic results are in countries with developed economy and science, because of factors as smoking, unhealthy diet and inactive lifestyle, which give rise to cancer appearance. For example, such sickness as obesity is associated with breast cancer, kidney, uterine, colon, and esophageal cancer. There a lot of kinds of cancer, but some of them are the result of infection or biological carcinogens. For example, it can be caused by parasites (bladder cancer and schistosomiasis cancer), viruses (human papillomavirus (HPV), cervical cancer, hepatitis B and C, and liver cancer) and bacteria (gastric cancer and *Helicobacter pylori* cancer).

But not only the usage of tobacco gives rise to cancer, but also excessive alcohol consumption is a result of such types of cancer as head and neck, esophageal, throat, liver and breast cancer.

Medical treat in case of cancer disease is very important, because if person does not have any medical treat and regular control, cancer cells will penetrate into nearest tissue and diffuse to other parts of the body through the lymphatic system and bloodstream. The case, which was described above, is called metastasis of cancer, and only this factor makes this disease so deadly, because it is very difficult and sometimes impossible to stop penetration and diffusion of malignant tumors to other tissues in the body.

But there are also benign tumors, which are slow growing and do not spread. Usually these tumors are innocuous if they do not influence on the function of nearest tissue.

In the end I would like to summarize that cancer is not just a disease. It is a group of sickness, which could occur at any site in the body and could spread very fast. There are no limits in understanding and controlling malignant disease, because of wide scientific knowledge and experience, which includes as individual choices and style of life as the complexities of intracellular molecular regulation. By the way to control planning,

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

implementing and evaluating disease strategies is very difficult, because of necessity of competent management and usage of the best available resources. Nowadays to prevent and control cancer is the most important topic in science and in the whole world.

3.2 Relevant theories and facts

Over the past centuries, mortality and morbidity patterns have been changing all over the world albeit with variations in timing and pace. These changes have been referred to as the epidemiologic transition.

This chapter deals with a well-known theory, epidemiologic transition theory, which was chosen as the core theoretical model, in order to provide a comprehensive theoretical framework for the comparison of mortality.

The epidemiologic transition theory provides a potentially powerful framework for the study of disease and mortality in populations, especially for the study of historical and international variations (Mackenbach 1993). Although its primary purpose was to describe and explain the spectacular fall in mortality which has occurred in all currently industrialized countries, it can also be used to speculate on the likely consequences of future changes in mortality in countries which are lagging behind those which have already completed the epidemiological transition (Beaglehole 1992). In addition this notion of a more or less fixed pattern of changes over time in cause specific mortality may lead us to interpret cross sectional differences between countries in cause specific mortality as being due to a different timing of the epidemiological transition, which in turn would suggest differences in stage of economic and social development as likely causes.

The term epidemiologic transition refers to the shift in cause-of-death patterns that comes with the over-all decline of death rates. In European countries the fall in death rates, which began after the middle of the eighteenth century, came about because of a decline in infectious disease mortality (chiefly from cholera and tuberculosis). The victory over infectious diseases allowed people to live longer and hence to develop the chronic degenerative diseases that became the main causes of death during the twentieth century: heart disease, CVD, and malignant tumors.

Before the eighteenth century the epidemiological pattern was far from stable but the shifts that occurred had no significant effect on the level of mortality. Some infectious diseases diminished in lethality, but other diseases replaced them. In 1960s it was thought that increases in life expectancy in the most advanced countries were nearing completion, but from the 1970s a major decline in CVD disease allowed new progress. Under the double effect of the continuation of the decline in infectious disease mortality, now largely eliminated, and the decline in CVD mortality, it is weight of mortality due to cancers that has been increasing.

The epidemiological transition is one component of a series of concurrent changes in population health. Running parallel to it is a functional component, referring to change in functional health status of the population (that is, abilities and disabilities), and a gerontological

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

component, referring to the increasing proportion of the old and very old age groups in the population, with their distinctive health problems. The term health transition is used to describe these various components in combination.

The transition is linked to improvements and advances in nutrition, hygiene and sanitation, and medical knowledge and technology. As such, the epidemiologic transition is related to the demographic transition and the nutrition transition, and is part of a more broadly defined health transition (Caldwell 2001). In addition to epidemiological changes or changes in health conditions, the health transition also incorporates related social changes such as a health care transition. The health care transition refers to the changes in the organized social response to the health needs of the population and deals with the way the health care system is organized to deliver its services.

The characterization of long-run changes in cause of death as an epidemiological transition was first made by the public health physician Abdel R. Omran in 1971 in a paper that became a classic in the literature of public health. "During the transition", Omran wrote, that there has been a change in the death disease – reasons of mortality, as infections and pandemics have been replaced by genetic and degenerative diseases. (Omran 1971). Omran represents three stages:

1. The stage before the transition – with average life expectancy of 20-40 years, caused by high mortality and fluctuations in population growth. The conditions for the life of individual are not proper, thus life expectancy at birth is very low.
2. The transition stage, which is much more positive, than the previous one. The pandemic and fluctuations are rather rare, occasional, and they do not cause such great mortality. Thus birth rate is rising and other life indicators improve. Life expectancy is about 30-50 years.
3. The stage after the transition, when the main causes of mortality are of degenerativity, and thus population naturally grows. In this case natality is the main factor of population growth and it can strongly influence this indicator.

Omran proposed three basic patterns of epidemiological transition: the classical (Western) pattern, the accelerated pattern (represented by Japan), and the contemporary or delayed pattern followed by most developing countries in Latin America, Africa, and Asia. He argued that the reduction of mortality during the nineteenth century in Western countries was determined primarily by ecobiologic and socioeconomic factors, the influence of medical factors being largely inadvertent until the twentieth century.

What should be retained from this schematic picture formulated in the early 1970s? Not a lot, according to the demographer John C. Caldwell. In 2001 Caldwell wrote, "*What happened in the mortality transition was the conquest of infectious disease, not a mysterious displacement of infection by degeneration as the cause of death. The resulting demographic transition with its changing age of death and the existence of large numbers of people afflicted with chronic degenerative disease (rather than life-threatening infectious disease) is important for planning*

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

health services and medical training, which is the current focus of the burden of disease approach" (Caldwell 2001). Other criticisms of Omran's account are that he suggested that the mortality decline would stop during the Age of Degenerative and Man-Made Diseases and that the epidemiological transition is universal, even if delayed for less-developed countries.

In a later contribution to the subject, S. Jay Olshansky and A. Brian Ault described the third stage of the transition as a plateau in epidemiological history where mortality once again attains an equilibrium, with a life expectancy at birth reaching into the 70s. This value was believed in the 1970s to be close to the biological limit to the average length of human life.

How long can this fourth stage of the epidemiological transition last? Olshansky and Ault inquired whether more debilitating conditions would replace heart disease and cancer as the main killers or whether people would die a non-disease-related "natural death" as James Fries suggested in 1980. But Olshansky and Ault contended that the shift to the fourth stage is the last of the transitions, given the likelihood that the human lifespan is finite (Olshansky and Ault 1986).

During the fourth stage proposed by Olshansky and Ault, the cause-of-death pattern continues to be modified because deaths are postponed toward older ages and the relative incidence of degenerative causes of death, cardiovascular diseases, and cancers varies by age. Thus the concept of a distinct fourth stage being added to Omran's three stages is debatable. An alternative description would show a lengthened third stage characterized by shifting proportions of degenerative and human-made diseases, thus preserving a pattern of epidemiological transition with three "ages". According to France Mesle and Jacques Vallin, however, this would not take into account the major epidemiological change represented by the "cardiovascular revolution" (Meslé and Vallin 2000). These authors divide the transitional stage into a first phase characterized by the decline in the infectious diseases and a second phase led by the decline in cardiovascular diseases, with possible additional phases to come. The study of mortality levels and cause-of-death patterns are of little practical help in assessing exact dates for the change from Omran's second stage to his third stage (around the 1960s) and even less for dating the change from Omran's third stage to the Olshansky and Ault's fourth stage (around the 1970s). The number of years separating the second and the fourth stages appears to vary across countries. But in reality the cause-of-death pattern exhibits a more or less smooth modification over time rather than discontinuous change.

According to Jean-Marie Robine, the study of the dispersion of individual lifespans provides support for the existence of only three stages (The epidemiologic transition theory. 2001):

1. The reference stage that precedes the fall in mortality—Omran's Age of Pestilence and Famine—which came to an end during the eighteenth or nineteenth centuries, depending on the country.
2. A first stage of transition, when the level of mortality fell and tended to stabilize as a consequence of the decline in infectious diseases affecting mainly children, resulting in a very large reduction in the disparities of individual lifespans around the mode. This

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Age of Receding Pandemics came to an end in the 1950s in the countries that had gone furthest in the transition, such as northern and Western Europe, North America, and Japan.

3. A new stage of transition (represented by these same regions) in which the mortality decline at adult ages, including the very old, becomes relatively larger than at younger ages and where the increase in life expectancy is no longer associated with a significant reduction in the dispersion of individual lifespans (Robine Jean-Marie 2001).

This new stage corresponds less to Omran's third stage—which in the early twenty-first century appears to have a weak empirical foundation—and more to the fourth stage proposed by Olshansky and Ault. It could be labeled the Age of the Conquest of the Extent of Life. This is the age when humans, having finally been liberated from the great epidemics, are increasingly able to experience the full extent of the potential duration of life. This stage too may eventually come to an end, perhaps to be succeeded by a further stage. Whether this will be the Age of Limits or something else is not known. But at present, in exploring their potential longevity, humans are making unexpected discoveries—such as finding that it is possible to live well beyond 100 years.

For a period after World War II, all developing countries seemed to be moving through an epidemiological transition; since the 1960s, that was no longer the case. Some countries, most notably those of Eastern Europe, failed to experience the cardiovascular revolution, thus deviating from the pattern described above. And a number of African countries, such as Nigeria, Zambia, and Zimbabwe, were struck by AIDS epidemics or by the resurgence of earlier diseases, without having completed the second stage of the transition. In the middle of the 1960s, life expectancies in the countries of Eastern Europe and the Soviet Union (including Kazakhstan) entered a period of stagnation or regression resulting from the combined effects of increased cardiovascular mortality, cancers, violence, and alcoholism.

Chapter 4

Research questions and hypotheses

4.1 Research questions

The goal of this thesis is to estimate the current cancer mortality rates in Kazakhstan, using the most accurate available cancer information, through detailed descriptive analysis of cancer mortality changes observed in comparison with some selected European countries, during the period 1986–2008. In order to achieve this, several objectives are summarized in this thesis:

- to analyse all-cause mortality patterns in Kazakhstan including their cause-of-death
- components in comparison with some selected European countries;
- to discuss an investigation of the quality of the different cancer mortality data sets;
- to describe a review of cancer mortality time trends, including differences in trends by sex, age group, site and speculating on the possible reasons;
- to analyse the estimation of standardised mortality rates of different cancer sites.

4.2 Initial hypotheses

The term “cancer” is commonly used to cover a wide range of diseases which all share a common feature, namely that cells in affected organs or tissues of the body (e.g. breast, lung, skin or bone marrow) continue to grow indefinitely, without reference to the needs of the body.

Many cancers have the capacity to spread to other parts of the body and to kill the patient. With more than 3 million new cases and 1.7 million deaths each year (Ferlay et al. 2007) cancer currently represents the second most important cause of death and morbidity in Europe.

Cancers have many causes. A few are the result of faulty genes; some are a consequence of an individual’s life history (e.g. how many children they have borne); some represent the longterm effects of exposure at any stage of life to cancer-causing agents such as tobacco

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

smoke; and many involve a combination of these factors. The cause or causes of many cancers remain unknown. Most cancers become much more common with advancing age.

The total annual numbers of new cases and deaths (per 100.000 population) for all cancers combined vary as much as two-fold between Member States of the European Union (EU). The range of survival rates is similarly wide. For individual cancers, the variation across Europe is even greater.

This reflects a wide range of social and epidemiological factors in Member States: cancer prevention programmes; screening programmes; cancer control plans; individual lifestyles and occupational exposures; the existence and accessibility of health-care facilities and technological infrastructure; and the availability of human, financial and material resources for health and economic development.

Cancer is becoming an important public health problem in Asian countries with aging of populations and changes in lifestyles associated with economic development. Today cancer is the third leading cause of premature death in Kazakhstan. Every year approximately thirty thousand Kazakhstani people are diagnosed with cancer. This underlines the necessity on raising general awareness of the scope of the cancer problem in Kazakhstan.

In the analyses of dynamics of cancer mortality the following four hypotheses will be tested:

1. The annual rates of newly diagnosed deaths from cancer (mortality rates) are changing. Some cancers (e.g. stomach cancer) are becoming less common, but others are increasing, such as malignant melanoma. The time trends in cancer risk also vary between European countries and some cancers show different trends between men and women, or young and old, or poor and rich. For instance, lung cancer rates are falling in many countries among men (particularly the more affluent groups) but increasing among women, particularly the young. In other countries, lung cancer rates are still increasing in both sexes. The pattern is similarly varied for many cancers, so the public health profile of cancer in Europe is complex. Trends in the incidence and mortality rates are also influenced by successes in health promotion (e.g. tobacco control), efficient screening (e.g. breast, bowel, and cervix) and better treatment. These have been reflected in lower incidence, reduced mortality, higher survival, improved life expectancy and a better quality of life for cancer survivors.

2. Cancer mortality is more equally distributed across Kazakhstan. The rates in Kazakhstan are close to the average of European countries. However, as in other CIS countries with high mortality from other causes than cancer, the proportion of cancer deaths comprise about 12 % of total mortality in Kazakhstan, compared to a 28 % average of European countries with very low child and adult mortality, and since 1990 the rate has been steadily decreasing. During 1992–2000 Kazakhstan experienced severe crisis after collapse of the Soviet Union. Cut in healthcare expenditure caused shortage of physicians, reduction of primary health care centers especially in rural area, and as a result access to the healthcare facilities for people was poor. We suppose that these factors could strongly affect the increase on cancer mortality in that period. Later, from 2001–2006 the situation in the country was more stable and new health care reforms were

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

implemented. Most possibly this could be the reason for the reduction of cancer mortality in a relatively short period.

3. There are wide inequalities within Kazakhstan in terms of who gets cancer, and what happens to them when they do. People from deprived backgrounds are more likely to get some types of cancer and overall are more likely to die from it once they have been diagnosed. For several reasons, cancer patients in Kazakhstan have poorer survival than in other European countries. Although many cancer patients receive excellent treatment, services are patchy—patients in different parts of the country receive varying quality and types of treatment. Experience of cancer care also varies, and long waits and uncertainty add to the inevitable anxiety of patients.

4. The decreasing risk of dying from most forms of cancer in the European Union is a major success but does not allow any room for complacency. The disparity between the health status in the populations of Kazakhstan compared with these of northern, central and Eastern Europe requires significant and speedy remedial intervention. There is an urgent need to undertake research in central and eastern Europe to identify the causes of the excess cancer (and other chronic disease) mortality rates; to monitor through time changes in biomarkers of chronic disease in response to public health policy; and to create resources for capacity building in research and training of researchers in the whole of Europe. In addition, it is almost too late to take action to be in a position to cope with the increasing cancer burden which will arise throughout Europe due to the ageing population.

Chapter 5

Data and methods

5.1 Data availability and quality

Mortality and mid-year population estimates data for calculating trends in cancer mortality in Kazakhstan and in selected European countries were taken from the World Health Organization Mortality Database (M-DB) (<http://www.euro.who.int/en/home>) For a review of selected socioeconomic characteristics, data from WHO European Health for All Database (HFA-DB) are used, which provide basic demographic and socioeconomic indicators, detailed indicators for study of mortality, morbidity, lifestyle, environmental quality, and quality health care. The data are available for all selected European countries, including CIS countries (Kazakhstan and the Russian Federation) for 1986–2008. (<http://data.euro.who.int/hfamdb/>).

Eurostat database was also used to complete some missing population data (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>). Mid-year population was obtained by calculating the arithmetic mean of year x and year $x+1$.

The study analyzed mortality data classified according to the abbreviated eighth, ninth and tenth revisions of the International Classification of Diseases. Data were obtained separately for males and females, by 5 year age-groups from age 0 to 85+.

Before discussing the cancer profile in selected countries, it is helpful to consider the definitions of terms such as cancer mortality, as well as the sources of such information, their availability and, where necessary, their estimation.

When estimating and projecting the cancer profile, chronological patterns in incidence or mortality rates depend not only upon the number of cases or deaths, but also on the quality of the denominators over time (Alderson 1981).

Population-based cancer registries collect and classify information on all new incident cases of cancer in a defined population. They also provide statistics on incidence for the purposes of assessing and controlling the impact of cancer in the community. There are currently more than

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

170 cancer registries in Europe, covering national populations (e.g. the Nordic countries, the Czech Republic) or certain regions within a country (e.g. in Italy, France).

The founding of cancer registries in Europe has occurred unsystematically over the last half-century, variously dependent on official policy to support and fund such activities, or on individual initiatives by research-orientated clinicians and pathologists (Parkin et al. 2001). As a result, European cancer registries differ enormously in the size of the population covered and the number of accumulated years of complete data available. Where regional registries do not cover the entire national population, they may not be entirely representative of the national profile of the cancer burden or patterns of risk.

Comparable, complete and accurate registry data are essential for drawing reliable inferences about geographical and temporal variations in incidence rates. The Cancer Incidence in Five Continents series is a major reference work. It was first published in 1962. The ninth volume covers new diagnoses of cancer from 1998 to 2002 in 100 registries in 29 European countries (Curado et al. 2007). Inclusion in the series is a good marker of the quality of an individual registry's data, because the editorial process includes numerous assessments of data quality.

Cancer mortality measures the impact of cancer, expressed either as the number of deaths occurring or as a rate (number of deaths per 100 000 persons per year). Mortality is a product of both the incidence and the case fatality of a given cancer. Mortality rates estimate the average risk to the population of dying from a specific cancer, while fatality represents the probability that an individual with cancer will die from it. Fatality is the inverse of cancer survival – the time between the diagnosis of cancer and death. Data are derived from vital registration systems in which (usually) a medical practitioner certifies the fact of death and the date and cause of death. The International Classification of Diseases provides a standardized system of nomenclature and coding, and a suggested format for the death certificate.

Mortality data are affected by the degree of detail and accuracy of the recorded cause of death and by the completeness of death registration. These are known to vary considerably between countries and over time. However, the available mortality data are more comprehensive than incidence data—the WHO mortality databank contains national cancer mortality data for 35 countries in Europe, available over extended periods of time for some selected countries.

In my thesis I also used official statistics from Russian statistical Agency (Goskomstat 2012) and Kazakh statistical Agency (The Agency of Statistics of the Republic of Kazakhstan 2012).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Tab. 1. List of selected countries, according to available years

Country	Code	ICD 8	ICD 9	ICD 10
The Czech Republic	4045	No	Yes (1986-1993)	Yes (1994-2008)
France	4080	No	Yes (1980-1999)	Yes (2000-2008)
Hungary	4150	No	Yes (1980-1995)	Yes (1996-2005)
Italy	4180	No	Yes (1980-2002)	Yes (2003-2007)
Kazakhstan	4182	No	Yes (1981-2003)	Yes (2004-2008)
Norway	4220	No	Yes (1986-1995)	Yes (1996-2008)
The Russian Federation	4272	No	Yes (1980-1998)	Yes (1999-2006)
Sweden	4290	Yes (1980-1986)	Yes (1987-1996)	Yes (1997-2008)

Source: WHO Mortality Database

5.2 International classification of diseases

The purpose of the coding process is to select the underlying cause of death and to translate the literal text of the listed conditions into ICD codes (WHO 1977, 1992). The selection of the underlying cause is very important, since the available international data used for between country comparisons are based on this single underlying cause. The ICD international coding rules are intended to promote in selecting this underlying cause in difficult cases.

All countries use the ICD codes to code the cause of death, but usually they apply different revisions of the ICD. In the 1990s, there were two revisions that were used in Europe (ICD-9 and ICD-10) that, in spite of common principles, have important differences – such as the number of codes (around 6,000 in ICD-9 and 12,000 in ICD-10). In the mid-1990s, most countries still coded using ICD-9; and the dates of any implementation of ICD-10 have varied across countries. This simultaneous use of different revisions of the ICD may lead to problems of comparability. (Jougl, E. et al. 2011).

Most countries are now routinely coding causes other than the underlying cause. This multiple coding is very useful because it facilitates the assessment of the consistency of the certification process and permits comparability studies based on multiple cause analysis. However, the total number of coded causes varies (and only a few countries code all the causes of death).

In most countries the selection of the underlying cause of death in the mid-1990s was still done manually by trained coders using the ICD rules, but an increasing number of countries began to use, or planned to implement, an automated coding system. This development is very important for two reasons. It will lead to marked improvement in the inter-country homogeneity of coding; and it will facilitate the coding of all the conditions for each death. (Jougl, E. et al. 2011)

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Tab. 2 List of leading causes of death according to the revisions of the International Classification of Diseases

Causes of death	ICD-8 Codes		ICD-9 Codes		ICD-10 Codes	
	ICD codes	WHO MD codes	ICD codes	WHO MD codes	ICD codes	WHO MD codes
1. All causes		A000		B00	1000	AAA
2. Infectious diseases	000-136	A001-A044	001-139	B01-B07 (CH01)	1001	A00-B99
3. Circulatory diseases	390-458	A080-A088	390-459	B25-B30 (CH07)	1064	I00-I99
4. Respiratory diseases	460-519	A089-A096	460-519	B31-B32 (CH08)	1072	J00-J98
5. Digestive diseases	520-577	A097-A104	520-579	B33-B34 (CH09)	1078	K00-K92
6. External Diseases	E810-E999	A138-A150	E800-E999	B47-B56 (CH17)	1095	V01-Y89
7. Neoplasms	140-239	A045-A061	140-239	B08-B17 (CH02)	1026	C00-D48
7.1.Malignant Neoplasms	140-209	A045-A060	140-208	B08-B14 (S08)	1027-1046	C00-C97
7.2 Other Neoplasms	210-239	A061	210-239	B15-B17 (S15)	1047	D00-D48
7.1.1 MN of prostate	185	A057	185	B124	1040	C61
7.1.2 MN of larynx	161	A050	161	B100	1033	C32
7.1.3 MN of lip, oral cavity and pharynx	140-149	A045	140-149	B08	1027	C00-C14
7.1.4 MN of trachea, bronchus and lung	162	A051	161-162	B101	1034	C33-C34
7.1.5 MN of colon, rectum and anus	152-154	A048-A049	153-154	B093-B094	1030	C18-C21
7.1.6 MN of oesophagus	150	A046	150	B090	1028	C15
7.1.7 MN of lymphatic and haemopoietic tissue	204-209	A059-A060	200-208	B14	1043-1045	C81-C96
7.1.8 MN of stomach	151	A047	151	B091	1029	C16
7.1.9 MN of female breast	174	A054	174	B113	1036	C50

Source: WHO Mortality Database documentation and ICD (<http://www.who.int/classifications/icd/en/>)

According to the selected countries four different causes of death code description tables were used. Table 2 illustrates codes of selected causes of death for all selected countries in taken time period 1986-2008. These list of codes for the selected causes of death were taken from the basic tabulation list and the special coding for some newly independent states of former USSR in the ninth revision. We must mention that according to the code descriptions of cause of death, which was presented by WHO, codes in case of Kazakhstan and the Russian Federation for calculation of mortality intensities from Basic Tabulation List table 6 of the ICD9 and Mortality tabulation List 1 of the ICD10 were used, codes for the other selected countries used ICD8, ICD9 and ICD10 detailed third and forth character.

The selection of cancer sites for this thesis is by no means definitive, a total of 11 specific cancer sites were selected for analyzing among males and females, excluding malignant

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

neoplasms (see Table 2). Some of these sites include two or more distinct cancer types with different epidemiologies and implications, for example colorectal cancer, which comprises both colon and rectal cancers; malignant neoplasm of oesophagus, which comprises both squamous cancer of the upper and middle third and adenocarcinoma of the lower third; cancer of lip, oral cavity and pharynx; and malignant neoplasm of trachea, bronchus and lung. The ability to model different cancer types within a site was limited by the available data.

Mortality data by main causes of death among the selected countries were collected according above mentioned list of codes, taking in account that fact, the mortality data in the case of some selected countries is relatively new, for instance, most of selected European countries switched to the 10th revision of the ICD in middle of 90s. At the beginning of 2000, they were already finished their transition to ICD10. The situation in Kazakhstan was quite different. Kazakhstan started its transition to 10th revision of the ICD later than all other selected countries, only in 2004. (World Health Statistics 2008)

Standardised death rates by main causes of death in Kazakhstan proved that the cause-specific mortality levels for this country in the following years after switching to ICD10 were transformed without any large fluctuation in selected rates. Standardised death rates showed the number of death from selected causes per 100.000 populations in a given year, which are separated for males and females. So we can say that Kazakhstan succeeded in transformation to ICD10 in 2004.

5.3 Adopted approaches and methods used

In order to capture major trends and patterns of the Republic of Kazakhstan, the Russian Federation and some selected European countries (the Czech Republic, France, Hungary, Italy, Norway, and Sweden) the following conventional mortality indicators were used: Crude Death Rates (CDR), Age–Standardised Death Rates (SDR), and Life expectancies. In addition, one more conventional indicator is used, namely the method of decomposition. The analysis of mortality is based on abridged, five–year mortality tables.

The Crude Death Rate (CDR) describes mortality in relation to the total population. Expressed per 100,000 inhabitants, it is calculated as the number of deaths recorded in the population for a given period divided by the population in the same period and then multiplied by 100,000.

$$\text{Crude Death Rate (CDR)} = \frac{\text{number of deaths during time period}}{\text{total population at mid-point of time period}} \times 100,000$$

The crude death rate is the ‘crude’, unadjusted mortality per person year, specified as the midyear population. Thus, the population structure strongly influences this indicator, as age is a major determinant of mortality. All other things being equal, in a relatively ‘old’ population,

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

there will be more deaths than in a 'young' one because mortality is higher in higher age groups. (Free medical textbook 2011).

For comparisons, the age effect can be taken into account. The direct method is applied for standardisation by using a standard population. The (Age-) Standardised Death Rate (SDR) is a weighted average of age-specific death rates. The weighting factor is the age distribution of a standard reference population. The standard reference population used is the 'European standard population' as defined by the World Health Organisation (WHO). Since the European Population Standard is a unisex standard, it also can be used for comparison between sexes.

$$SDR = \left[\sum_0^{\infty} (M'_a P^s_a) \right] / P^s_x * 100000 \text{ where } M'_a \text{ is the age-specific mortality rate for}$$

P^s is the total standard population. As most causes of death vary significantly with people's age and gender, the use of standardised death rates improves comparability over time and among countries and regions. (Natural vital statistic reports 2009).

Life expectancies can be calculated for any age. They refer to the mean number of years still to be lived by a person who has reached a certain exact age, if subjected throughout the rest of his or her life to the actual mortality conditions (age-specific probabilities of dying). Life expectancies are calculated using a life table. In order to calculate life expectancy, life tables were calculated based on population and mortality data in 5-year age groups up to the age of 85+ (0;1-4; 5-9;10-14; ...; 80-84; 85+).

The study uses the classical demographic method of decomposition, which is based on calculating the contribution of individual age groups to the overall difference between two life expectancies at birth (e_0). We used the approaches proposed by Pressat (Shkolnikov et al. 2001). The difference in life expectancies may be expressed exactly as the sum of age-specific effects. (Shkolnikov, V. 2001)

$$e_0^2 - e_0^1 = \sum_{\xi=0}^{85+} \left[(e_{\xi}^2 - e_{\xi}^1) * \frac{l_{\xi}^2 + l_{\xi}^1}{200000} - (e_{\xi+n}^2 - e_{\xi+n}^1) * \frac{l_{\xi+n}^2 + l_{\xi+n}^1}{200000} \right]$$

where: $2, 1 \xi \xi 1 1$ and $2, 1 n n 1 1 \xi + \xi +$ is a table number of persons alive at exact age ξ and $\xi + n$ from mortality tables of population 1 and 2. $2 1 \xi, \xi e e$ and $2, 1 n n e e \xi + \xi +$ is a expectation of life at exact age ξ and $\xi + n$ from mortality tables of population 1 and 2. For analysis of differences in life expectancies, we used Pollard's (1988) two-dimension method:

$$e_0^2 - e_0^1 = \sum_{\xi=0}^{85+} \left[(m_{\xi, \xi+n}^{1,1} - m_{\xi, \xi+n}^{1,2}) * w_{\xi \xi} * n \right]$$

where: $1, 1 I x x n m +$ and $2 1 I x x n m +$ is a mortality rates by causes of death of population 1 and 2 in age groups x and $x+n$. $w_{\xi \xi}$ is a weight of average future years lived beyond age x that tells how much influenced the mortality rate deferential,

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

$$w = \frac{1}{2} * \left[\left(\frac{l_{\xi}^2 + l_{\xi}^1}{200000} * \frac{e_{\xi}^1 + e_{\xi}^2}{2} \right) + \left(\frac{l_{\xi}^1 + l_{\xi}^2}{200000} * \frac{e_{\xi}^2 + e_{\xi}^1}{2} \right) \right]$$

where: l_{ξ}^1 and l_{ξ}^2 is a table number of persons alive at exact age ξ and $\xi + n$ from mortality tables of population 1 and 2. e_{ξ}^1 and e_{ξ}^2 is a expectation of life at exact age ξ and $\xi + n$ from mortality tables of population 1 and 2. For calculation of the weights of exact age 0, used the following formula:

$$w_{0.5} = \frac{1}{2} * \left[\left(\frac{0.9 * l_0^2 + 0.1 * l_1^2}{100000} \right) * (0.9 * e_0^1 + 0.1 * e_1^1) \right] + \left(\frac{0.9 * l_0^1 + 0.1 * l_1^1}{100000} \right) * (0.9 * e_0^2 + 0.1 * e_1^2)$$

The sum of individual contributions by age groups and causes of death is exactly equal to the difference between the values of life expectancies at birth of the two populations, because of the interactions of individual causes of death. (Global health risks 2009)

The decompositions are made for each country separately as well between Kazakhstan and selected European countries during the twenty-year period under consideration, and separately by sex so that comparisons may be made in the age and sex patterns of contributions to over time.

Decomposition of life expectancy at birth has the advantage of weighing age groups so that young age groups have a higher impact on the remaining life expectancy than older ones. It is important for Kazakhstan where infant mortality is very high. Correspondingly, it has a great influence on life expectancy also. Negative and positive contributions of all age groups sum up the total difference observed in life expectancy. Decomposition is based on life tables up to the age 85+. Unspecified deaths numbers were proportionally distributed.

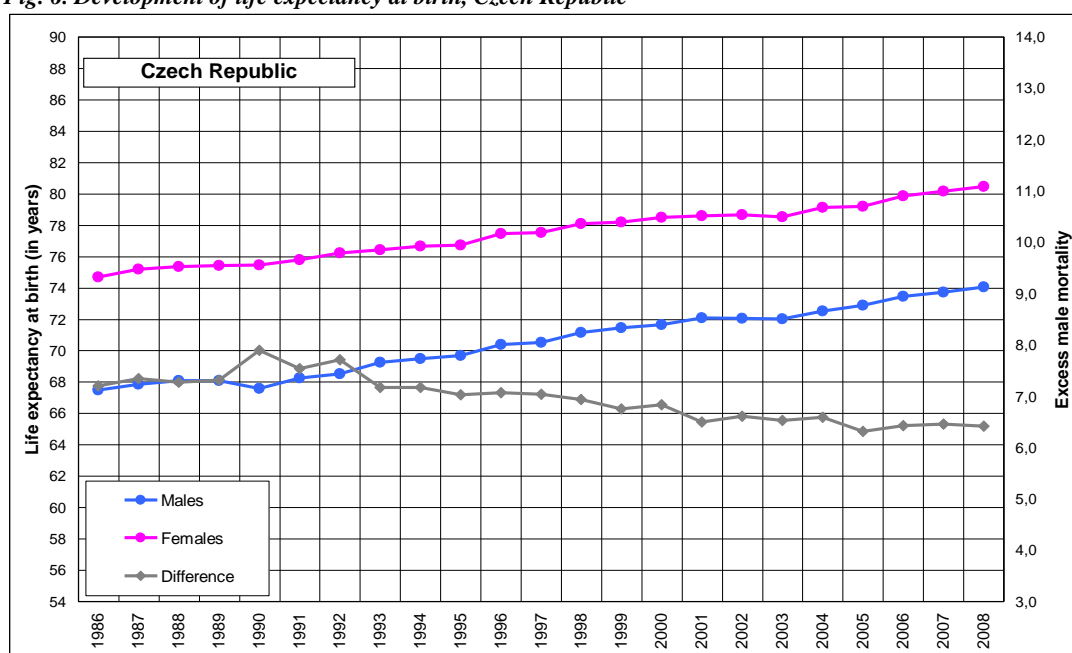
In this thesis I also use so called Potential years of life lost (YPLL). According to the Association of Public Health Epidemiologists in Ontario it is a summary which obtains measuring of premature mortality. This measuring includes explicit way of weighting deaths, which were occurred at younger ages (Association of Public Health Epidemiologists in Ontario, 2005).

Chapter 6

Analysis of general mortality trends in the selected countries between the period of 1986-2008

6.1 Changes in life expectancy at birth among the selected countries

Fig. 6. Development of life expectancy at birth, Czech Republic



Sources: Author's own calculations based on data from WHO mortality database

On this figure 6 we make development of life expectancy at Czech Republic from 1986 till 2008, for both sex and and derive a curve of the difference in life expectancy between men and women. How we can see that life expectancy of females in the Czech Republic is longer than males. According to statistics, male life expectancy in the Czech Republic is 74.1 years and women 85 years (2008). If in 1993 the average Czech lived averagely 69.3 years, and Czech

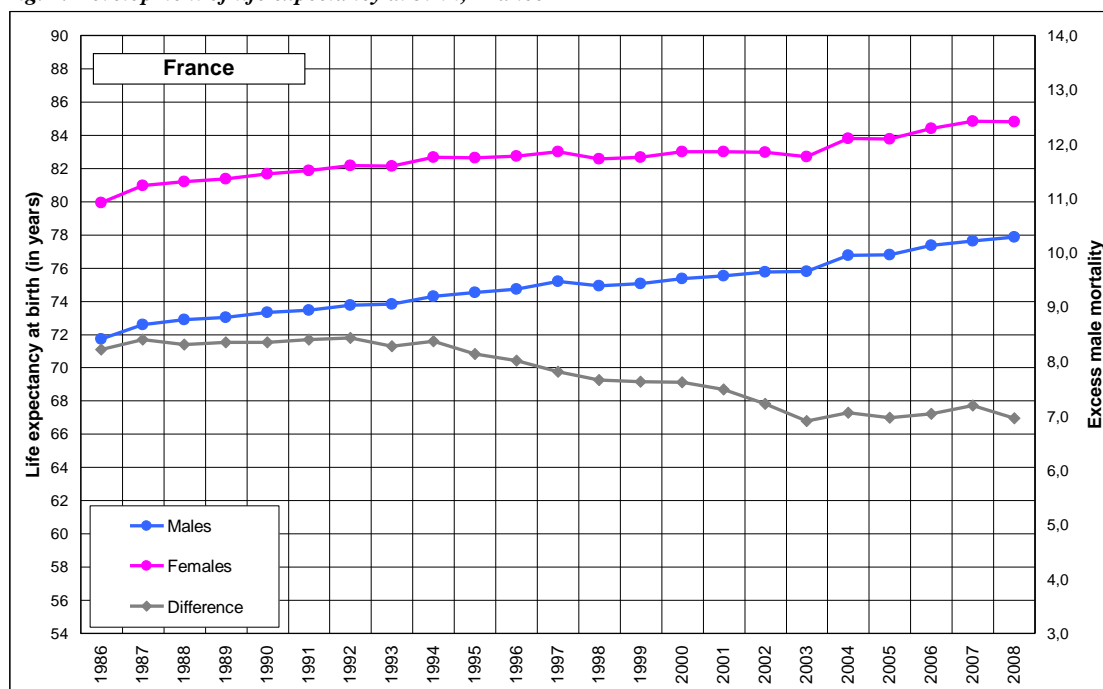
Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

women - to 76.5 years, but now they can count to 75 and 80 years respectively. The difference in life expectancy between men and women differ in 6.4 years. Figure 6 shows that difference progressively decreases, and in 2008 it was 6,5 years.

Life expectancy in the Czech Republic continues to grow from year to year. Only in the last 20 years, male life expectancy increased by seven years, and women for 5 years.

The Czech Republic belongs to the EU countries, where life expectancy is increasing at a record pace. Over the past 100 years, life expectancy increased by about 25 years.

Fig. 7. Development of life expectancy at birth, France



Sources: Author's own calculations based on data from WHO mortality database

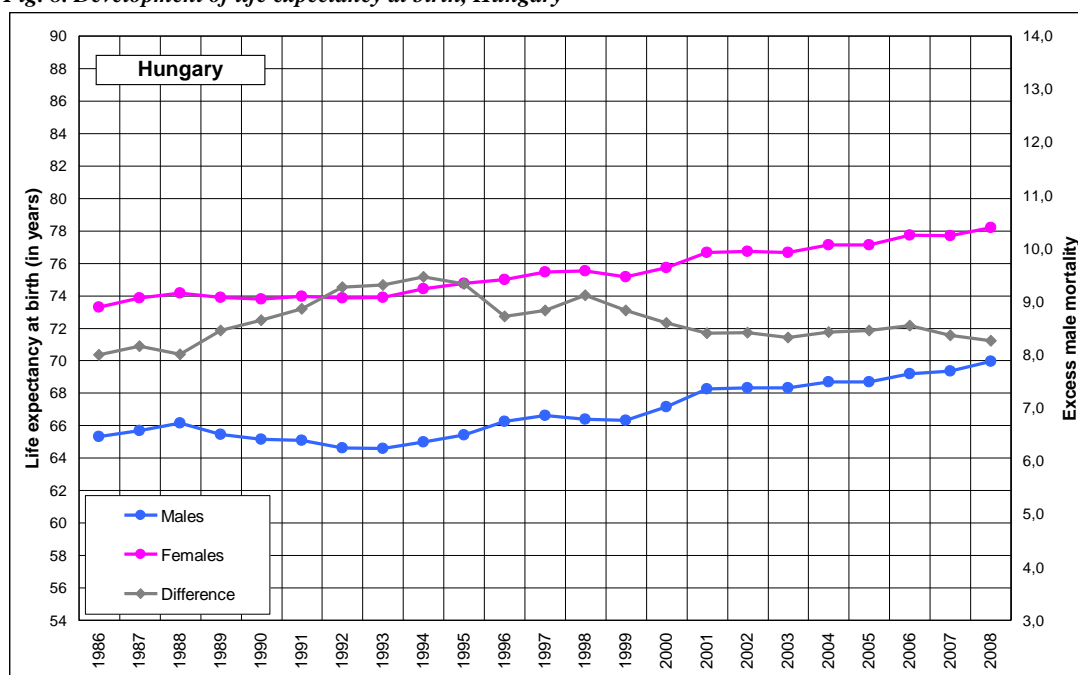
On that figure 7 we can see life expectancy at birth in France at period 1986-2008 years. The average life expectancy of French women in 1986 was 80 years, and French man 71.7 years. But the total average life expectancy of French women - 83.8 years for men - 76.7 years, i.e. on average - 80.2 years (Japanese live on average 81.9 years, and the inhabitants of Monaco - 81.2 years).

It should be noted that the population of France could actually be proud of one of the highest levels of life on the planet according to the classification of the UN. In terms of human development index, which is calculated on the basis of life expectancy, education levels and living standards, France is in 12th place.

These results have been achieved, primarily due to one of the best in the world of social insurance and health care. Thus, the French social security system includes unemployment benefits, old age pensions and disability, different family allowances, reimbursement of expenses for medical treatment, etc.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 8. Development of life expectancy at birth, Hungary



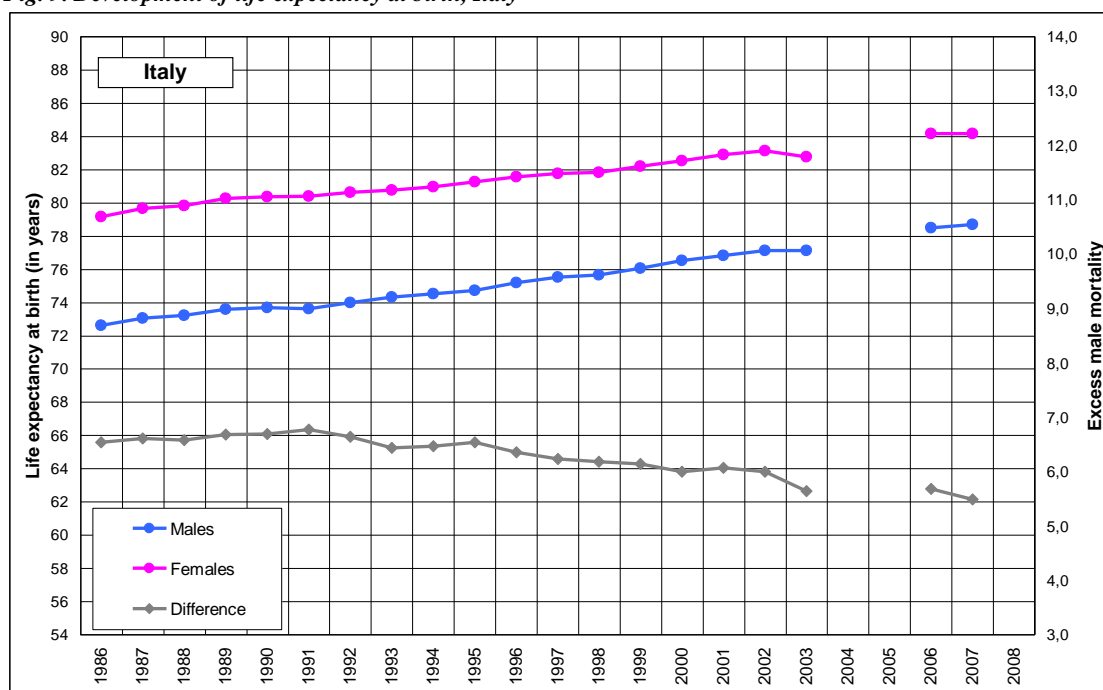
Sources: Author's own calculations based on data from WHO mortality database

We can see from the figure 8 above, life expectancy of Hungary is not so high. Estimated life expectancy at birth: the entire population - 72.4 years, female – 77.1 years male - 68.7 years old (as of 2005). Difference in life expectancy is 8.4 years. As we see the curves are not so fluctuating, but have a positive tendention, except the nineteenth years of the 20th century, when the flow of the curves was in the negative direction. The second particularity is that the difference between life expectancy of male and female decreases, which can be also explained by economic, political and social stability in the country.

Hungary is one of the EU state which became memner states at same time with the Czech republic. There were no wars or military periods during the recent years; the conditions of work and holidays for men and women has been very unified for both sex. Probably this is also the reason why life expectancy has increasind tendency.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 9. Development of life expectancy at birth, Italy



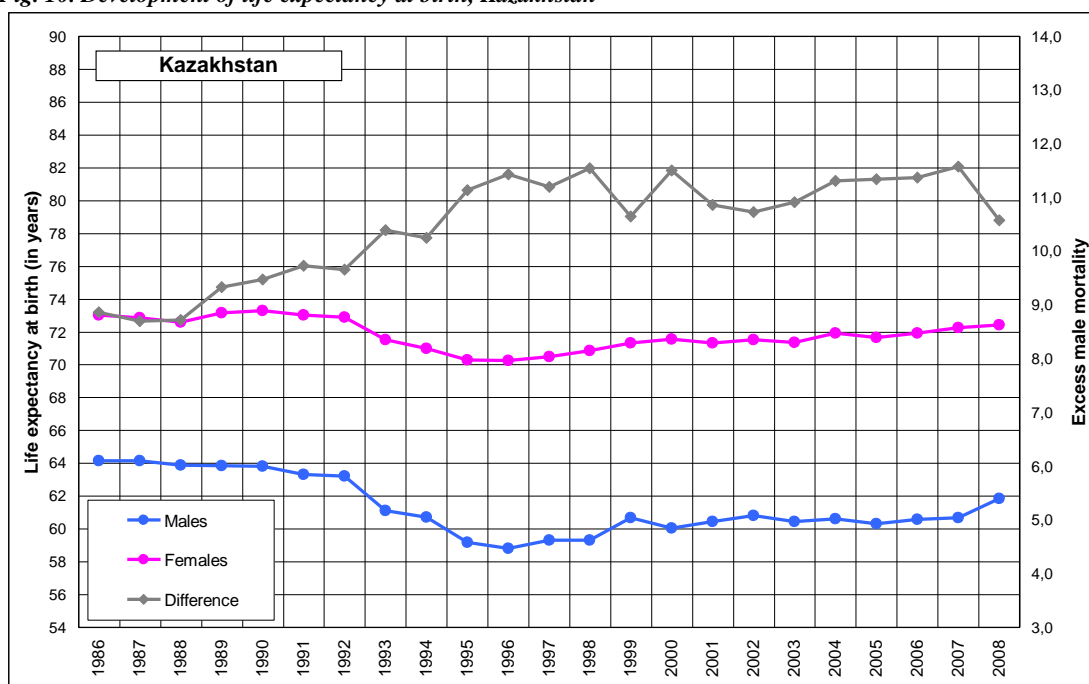
Sources: Author's own calculations based on data from WHO mortality database

Italian Institute of Statistics says that in Italy the highest life expectancy in the world. The average life expectancy of Italian men, according to a study of 77.2 years and women - 82.8. Life expectancy for males in 1974 to 2003 increased by 7 years, and women - nearly 8. Do not forget that Italy is one of the countries of Europe, where people smoke more in comparison to other countries.

But Italians are among the most healthy people with the highest life expectancy. We claim that this is due to red wine, olive oil and Mediterranean food. These parameters can be linked to the fact that Italian doctors and medical personnel are among the most highly qualified in the world, and the number of doctors per capita Italy ranked first in the world (1 doctor per 160 inhabitants).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 10. Development of life expectancy at birth, Kazakhstan



Sources: Author's own calculations based on data from WHO mortality database

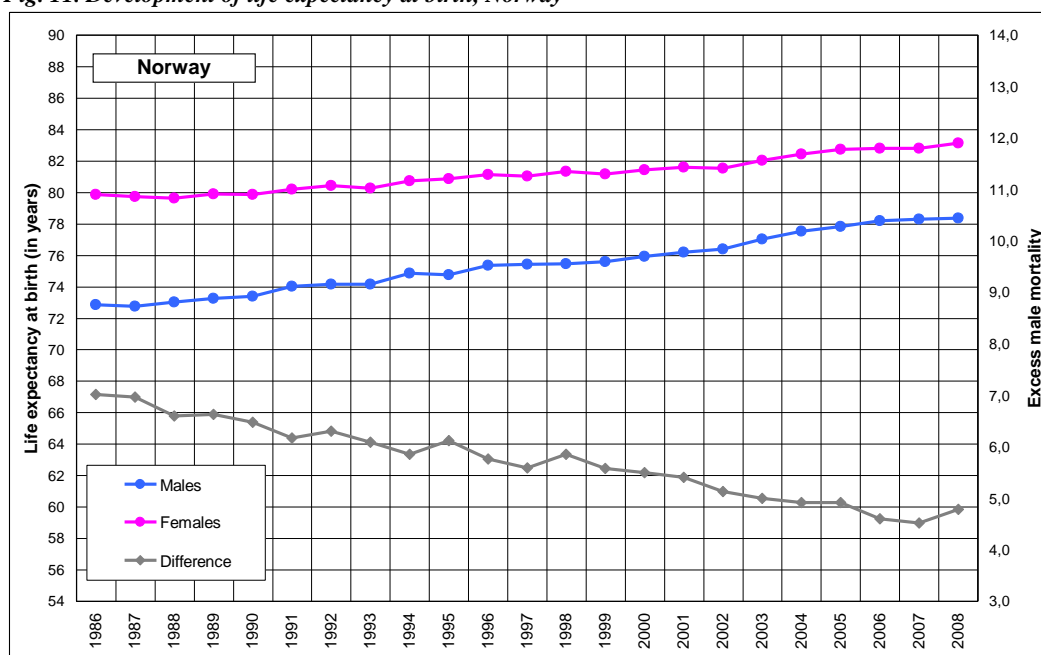
In 2009 the life expectancy of the population in the country was 68.6 years. If we talk about the year 2008, it was 67.1 years, that is, there is an increase in life expectancy. However, I would like to say that men have a life expectancy increased by 1.7 years and for women - 1.1 years. However, as noted on the graph in Kazakhstan is the difference in the gap in life expectancy between men and women over the natural difference in 5 years and 9.9 years. Sexual imbalance has developed because of the high mortality of men compared to women

Men must have a high mortality associated with social causes. It is dominated by causes such as suicide, injuries, deaths due to smoking, alcohol use, stroke, heart attacks, nervous disorders, it is a depression.

In this country on average, men die before retirement (under the legislation Kazakh men retire at 63 years), because life expectancy is only 62.8 these years, women - 73.6 years. In rural areas the corresponding figures were 64.7 years for males and 73.5 years for women.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 11. Development of life expectancy at birth, Norway

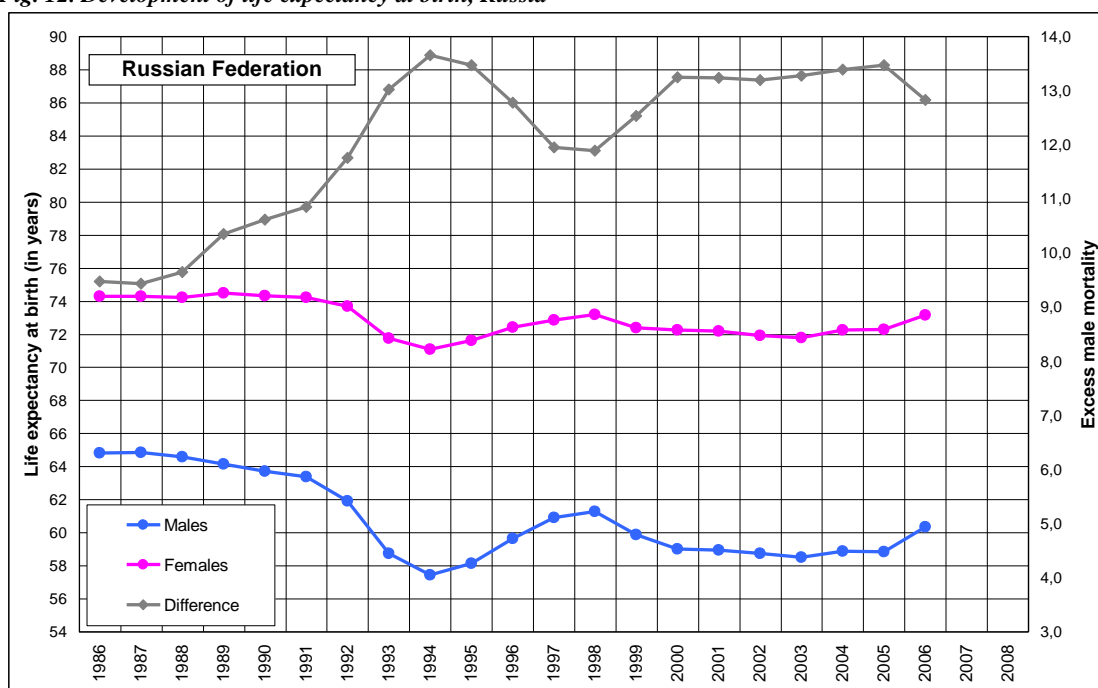


Sources: Author's own calculations based on data from WHO mortality database

The rankings of countries on this indicator as a standard of living into account the following factors: life expectancy, educational attainment and the value of GDP per capita (at purchasing power parity). The standard of living in Norway is among the highest in the world. You can see from our figure that life expectancy is so high. Average age of women reaches 83 years, and for male 79 years. Norway shares the 13th place with New Zealand. It would seem, is not very high. However, the average life expectancy - 80.2 years (males - 77.8, female - 82.5). In the world the figure is 67.2 years. Thus, life expectancy in Norway for more than 10 years, more global.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 12. Development of life expectancy at birth, Russia



Sources: Author's own calculations based on data from WHO mortality database

Currently, life expectancy for Russian men is the lowest in Europe. The average Russian citizen males lived 58.8 years. The Russian women, life expectancy, according to Rosstat data, is 72 years.

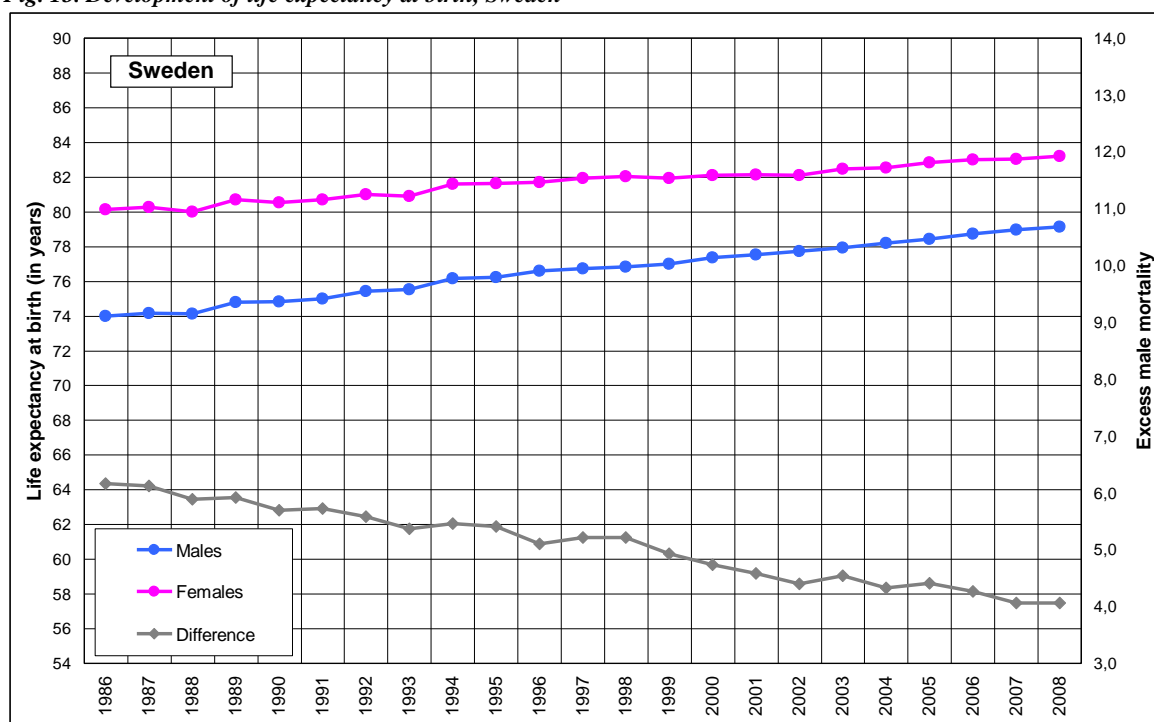
For male life expectancy Russia is 134th in the world, and women - the 100-th place. The average life expectancy of Russians as a whole - just over 65 years. "The positive trend of mortality reduction, outlined in the 1995-99 years, unfortunately, has not been fixed," - said Minister of Health and Social Development Minister Mikhail Zurabov

The main factors for high mortality of Russians - cardiovascular diseases and external causes (accidents, poisonings and injuries).

A distinctive feature of the demographic situation in Russia - a vast difference between life expectancies of men and women. In the developed countries and countries with developed health care system, it is 5-8 years in Russia - about 13 years.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 13. Development of life expectancy at birth, Sweden



Sources: Author's own calculations based on data from WHO mortality database

According to the data, life expectancy in this country is growing and is currently 83.2 years for women and for men - 79.1. Sweden is one of the countries where life expectancy is relatively high. Scandinavian states are particular by their social conditions and way the Government of the countries treat its inhabitants – there is a well developed social infrastructure, including ecological layouts. Scandinavian countries take care not only about individuals and human beings, but also nature, flora and fauna, as well as of other natural surroundings. That is the most probable reason why people live in consensus with nature, enjoy their lives and live until that high age.

After comparing countries I would like to represent the figure 11, 12 which is showing the comparison of life expectancy for males only in the mentioned countries. The “winners” in the categoria are France and Sweden (the reasons have been described in the text above). The worst results among the smparable states are in the Norway, Russian Federation and Hungary.¹

This difference represents the average around 3-4 years. The highest life expectancy shows France, in contrast to Kazakhstan, which in the period from 1995-2000 shows the worst results in life expectancy after 65 years. Also very rapid changes can be observed in countries: Czech Republic and Hungary, from 1992 year on those countries are observed a significant increase in life expectancy, which grew at an average of about 2-3 years.

With regards to the countries: Kazakhstan and Russia, here, in 1991, one can observe a sharp recession life expectancy of the male population, we can suggested that this is due to with the collapse of the Soviet Union and formation the independence of these countries.

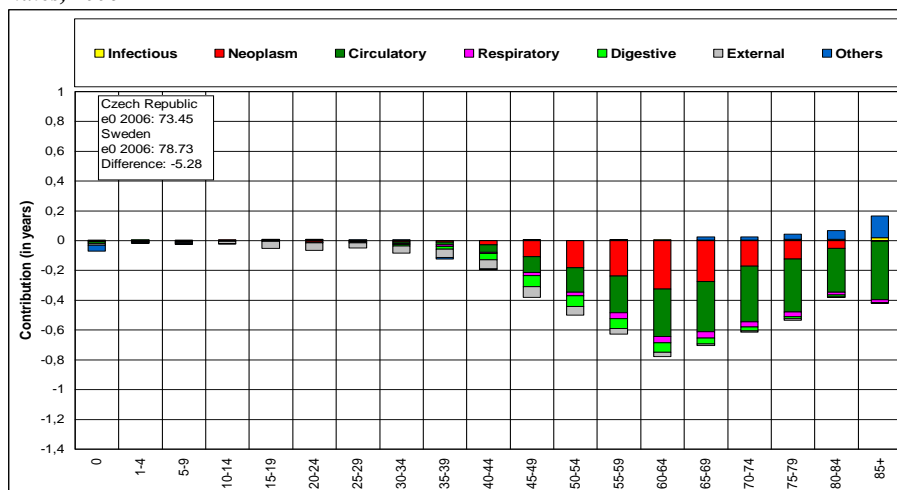
¹ Also I would like to mention “the worst” results are just within this particular group of countries, but the results will be different while comparing life expectancies with other representatives.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

6.2 Decomposition of life expectancy at birth

The following figure 14 shows ratio of mortality rate of Czech Republic and Sweden at 2006 year. According to graph the peak of mortality of man on those countries is on ages 60-64, the most prevalent factors are neoplasm and circulatory disease.

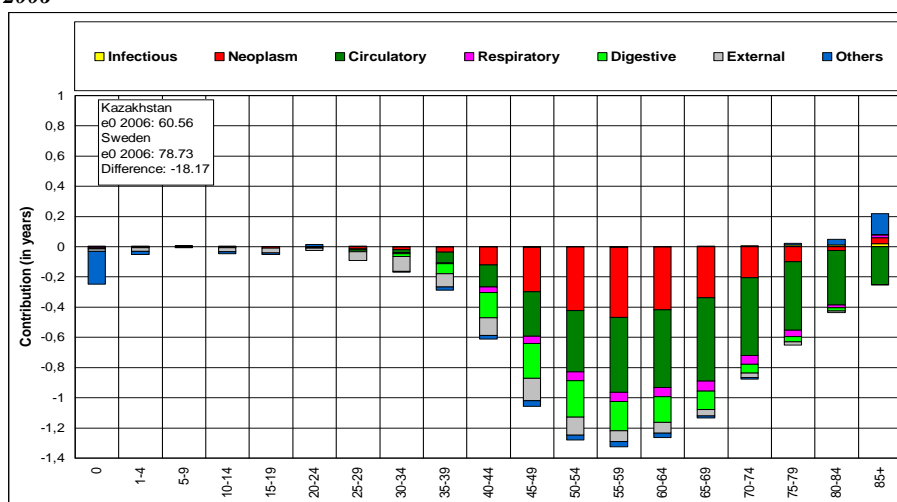
Fig. 14. Decomposition of the Czech Republic-Sweden gap in life expectancy by age and main causes of death for males, 2006



Source: Author's own calculations based on data from WHO mortality database

Next figure 15 shows the mortality rate of male population of Kazakhstan and Sweden at 2006 year. In the ratio of these two countries we can say that the largest number of deaths occurring in the age group 55-59 years. The most common diseases are neoplasm, circulatory and digestive.

Fig. 15. Decomposition of Kazakhstan-Sweden gap in life expectancy by age and main causes of death for males, 2006



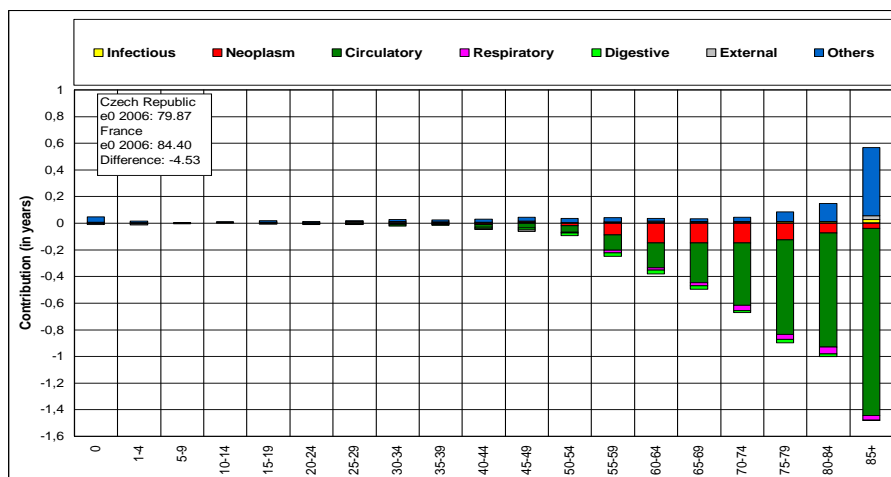
Source: Author's own calculations based on data from WHO mortality database

Given figure 16 shows the ratio of mortality of the female population on Czech Republic and France at 2006 year. Based on the graph we can say that female population reached 85 years of age die mostly from circulatory diseases. A big percentage of death is from neoplasm and digestive diseases. The most "risk ages" almost for all sorts of diseases is between 40 – 80

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

years. The maximum of the chart is shown in the point 55, 59 years old – the year of retirement in many of the countries.

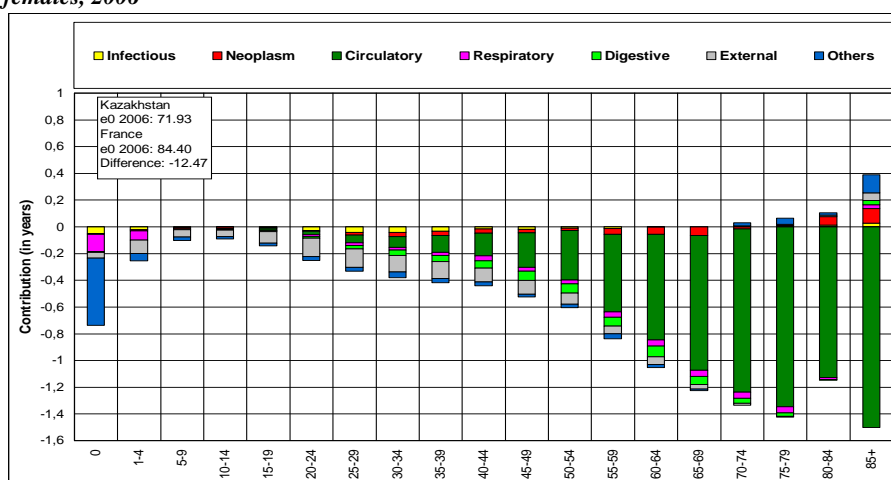
Fig. 16. Decomposition of the Czech Republic-France gap in life expectancy by age and main causes of death for females, 2006



Source: Author's own calculations based on data from WHO mortality database

The next figure 17 shows the mortality rate of female population in Kazakhstan and France at 2006 year. The graph indicates that the female population from 25 till 79 very often dies from circulatory disease and digestive diseases. Female population has attained 85 years of age mostly are subject to circulatory diseases. There is also percentage of people that die from neoplasm disease between year 55, 59 and 80, 84. The female curve of decomposition of the main causes of death in the Czech Republic and France is quite different from the figure 17, as female curve shows the growth of diseases in the late ages. While making decomposition of Kazakhstan – France female's life expectancy and causes of death we can say that the main percentages of deaths were causes by circulatory diseases, primarily at the ages 35+. I have not mentioned yet that there is one more very obvious death cause – external factors which obtain relatively high percentage in all decompositions.

Fig. 17. Decomposition of Kazakhstan-France gap in life expectancy by age and main causes of death for females, 2006



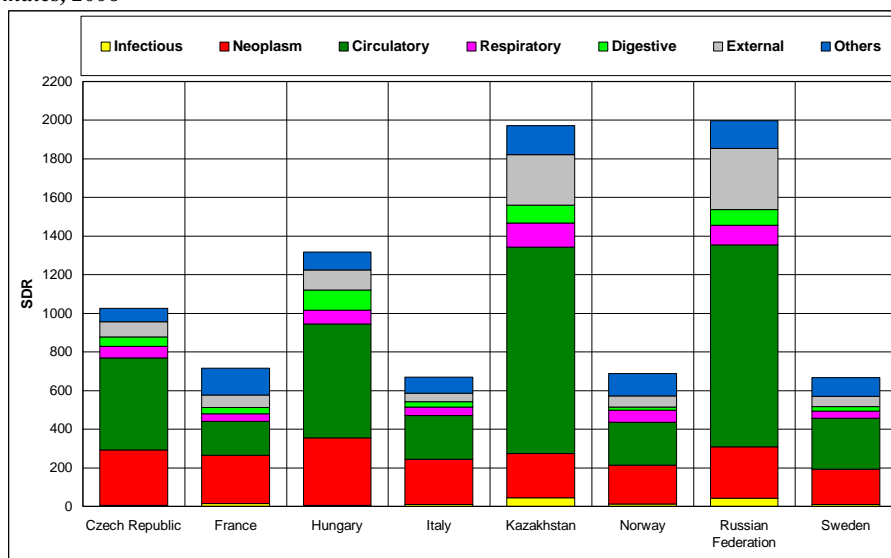
Source: Author's own calculations based on data from WHO mortality database

Chapter 7

Analysis of mortality trends by main causes of death in the selected countries between the period of 1986-2008

Followed graphs which decreases more common causes of mortality in listed above countries. The most common causes of death as for male and for female population are circulatory and neoplasm diseases. Next factors occurring more often on those countries are others, external. And should be noted that in Russia, Kazakhstan, France and Norway more often death due to cause of infectious diseases.

Fig. 18. Age-standardised mortality rates by main causes of death of mortality levels in the selected countries for males, 2006

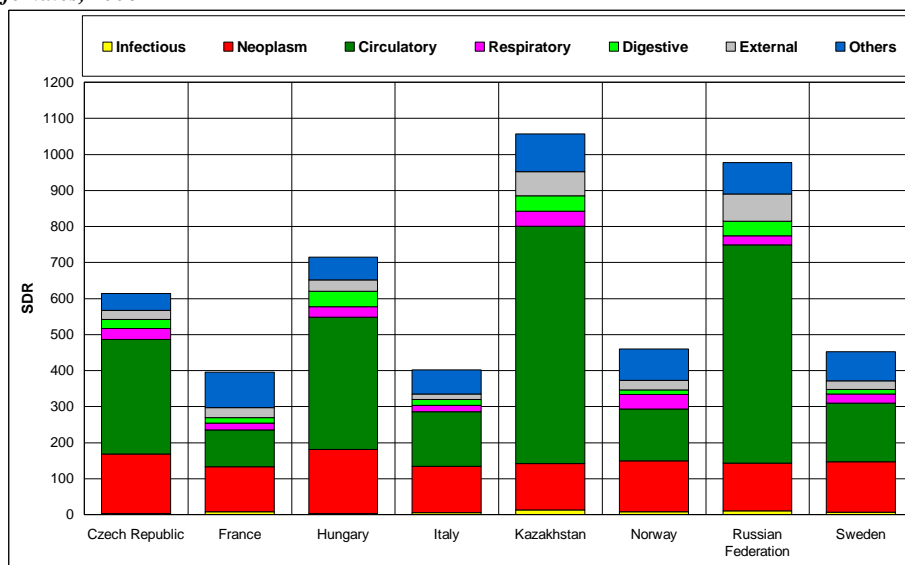


Source: Author's own calculations based on data from WHO mortality database

On the figure 18 I represent proportion of male death causes according to the states. Thus we can see that the most frequents causes of death are circulatory diseases – very likely for Kazakhstan, the Russian Federation and Hungary, but less likely for France, Italy and Norway. The second “most deadly disease” is neoplasm disease, which is characteristic for all the states independent on social infrastructure, development or progress. Kazakhstan and the Russian Federation have a big percentage of other death causes, such as car crashes, fires, natural catastrophes etc.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 19. Age-standardised mortality rates by main causes of death of mortality levels in the selected countries for females, 2006

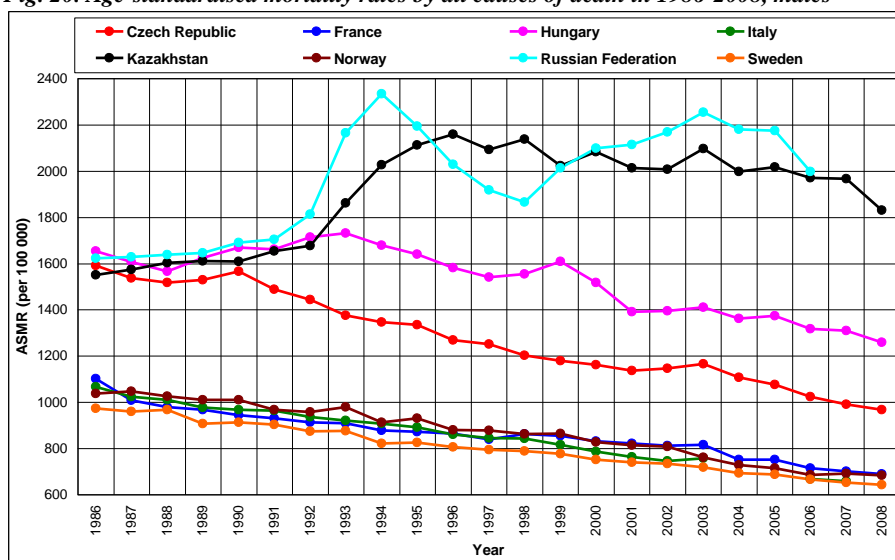


Source: Author's own calculations based on data from WHO mortality database

On the figure 19 I represent proportion of female death causes according to the states. The circulatory diseases are on the first position as in all previous decompositions. The same thing I can say about neoplasm diseases, as they are common for all the compared states, moreover the percentage is particularly the same. I would also like to mention about infections, as it can be called the disease of the previous century, but not very common for nowadays. The figure shows that a small percentage of infection diseases is still in Kazakhstan, Norway, France and the Russian Federation.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

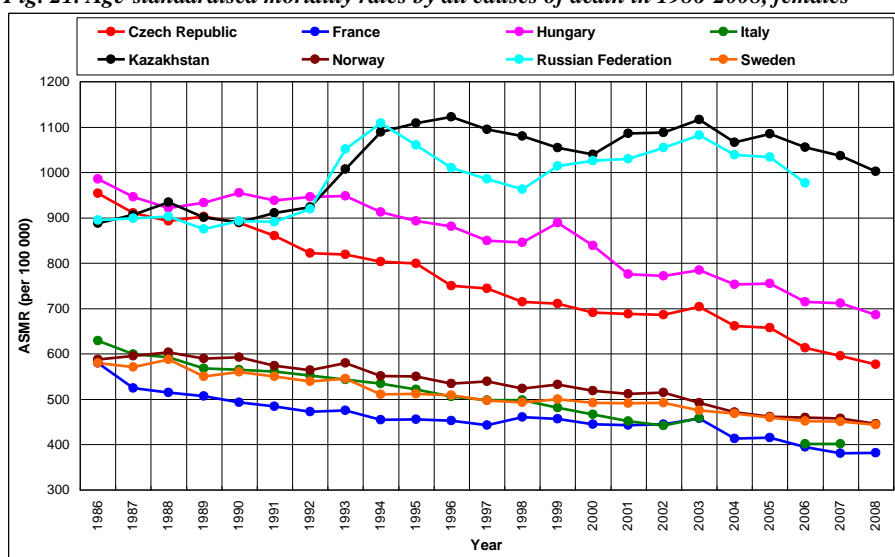
Fig. 20. Age-standardised mortality rates by all causes of death in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 21. Age-standardised mortality rates by all causes of death in 1986-2008, females

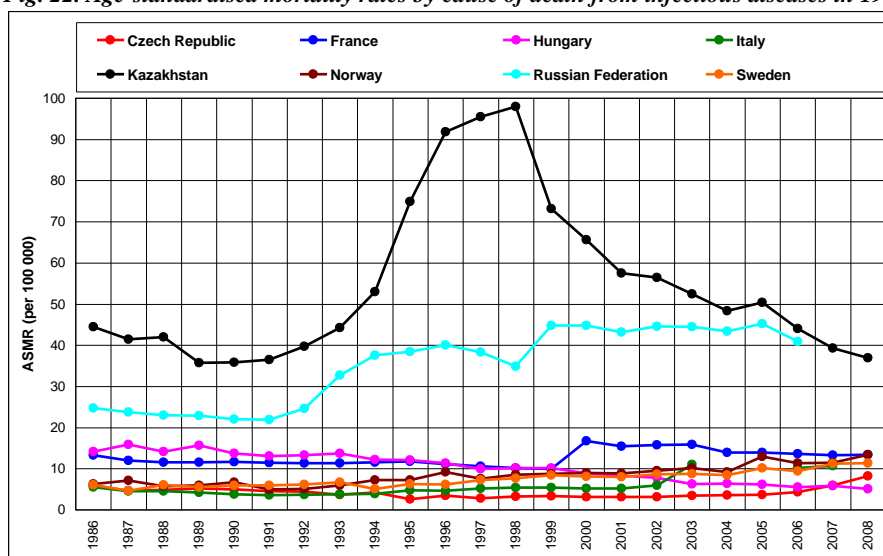


Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 22. Age-standardised mortality rates by cause of death from infectious diseases in 1986-2008, males

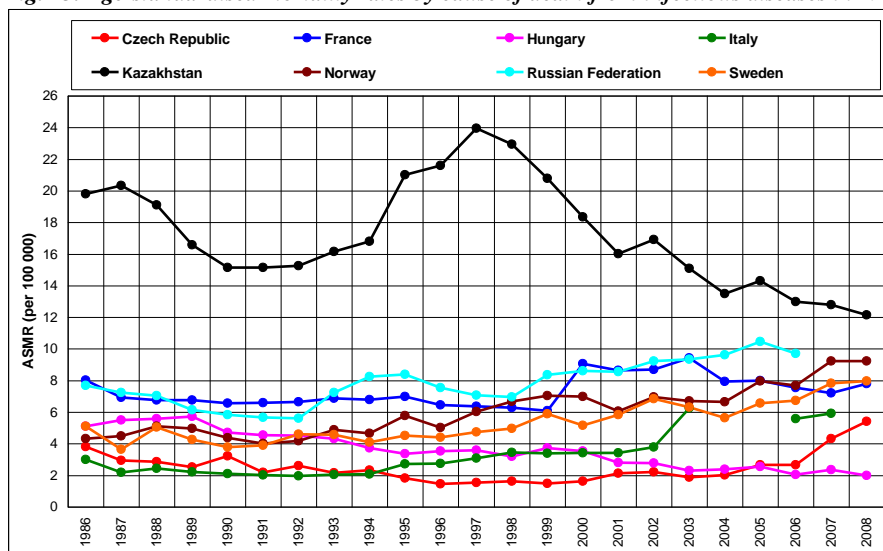


Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Following figure 23 shows the mortality rate of female from infection diseases on period from 1986 to 2008 years. How in previous graph the highest rate of mortality shows Kazakhstan and deferens of dead between male and female is around 600 – 650 thousands of people.

Fig. 23. Age-standardised mortality rates by cause of death from infectious diseases in 1986-2008, females



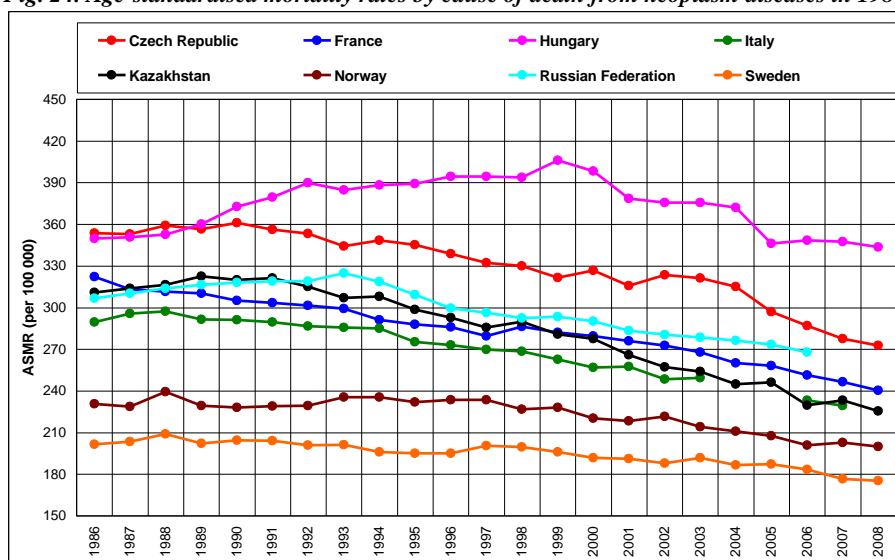
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

That figure 24 shows mortality rate of male population case of neoplasm diseases on 1986-2008 years. The highest mortality rate from cancers noted in Hungary, however the lowest rate noted in Sweden. The positive trend shows all of the above mentioned countries. On the base of that graph the rate of mortality in case of neoplasm diseases going down.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 24. Age-standardised mortality rates by cause of death from neoplasm diseases in 1986-2008, males

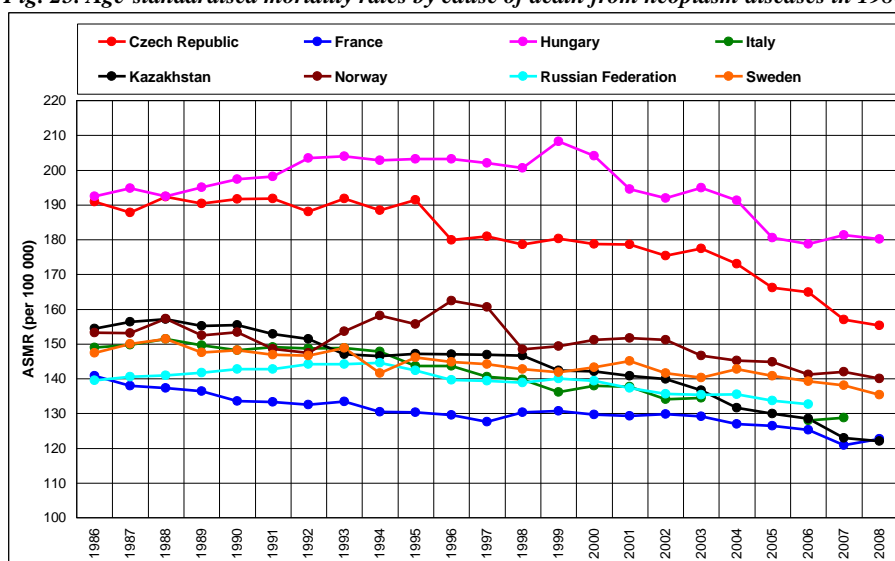


Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

On that figure 25 shows the mortality rate of female population from neoplasm diseases from 1986 till 2008 years. The highest point of death is in Norway and the lowest rate of mortality in France.

Fig. 25. Age-standardised mortality rates by cause of death from neoplasm diseases in 1986-2008, females



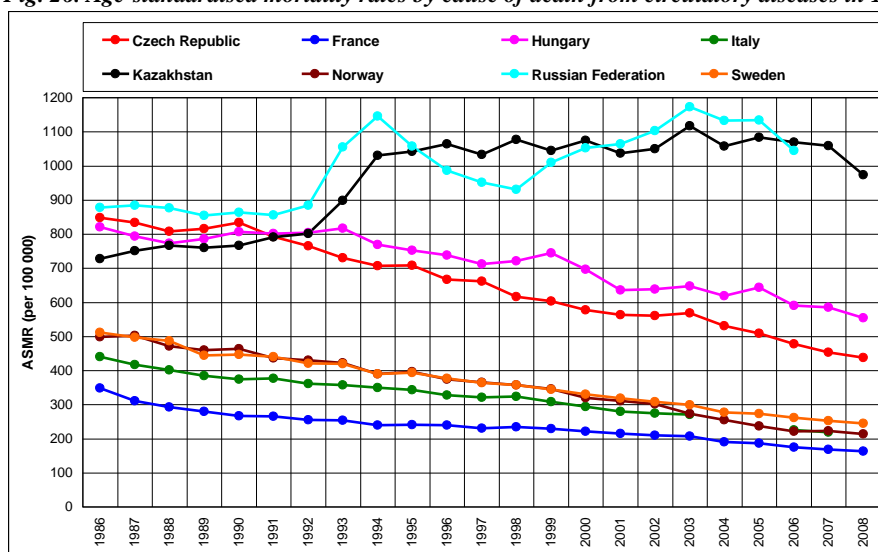
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

The next figure 26 shows the rate of mortality from circulatory diseases from 1986 till 2008 years. In case of circulatory diseases the highest rate of mortality was in Russia and Kazakhstan. The lowest rate was is France.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 26. Age-standardised mortality rates by cause of death from circulatory diseases in 1986-2008, males

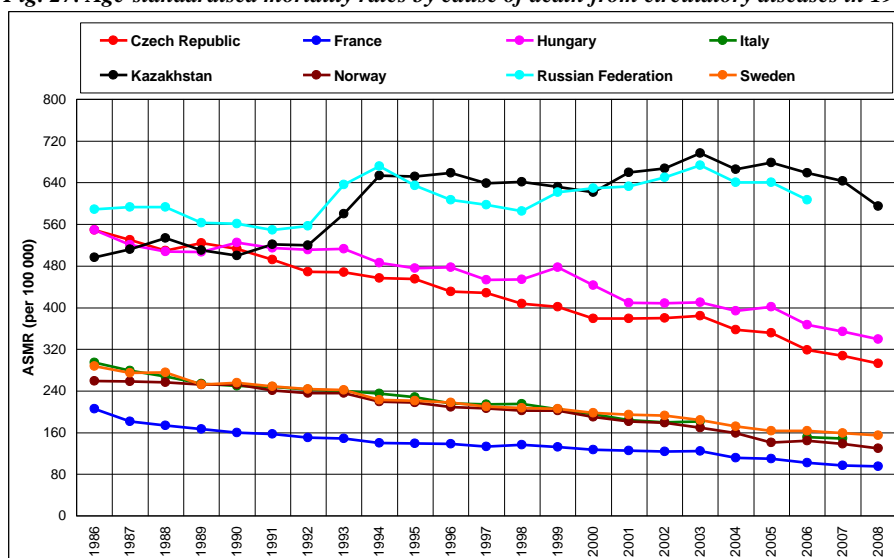


Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Figure 27 shows the mortality rate of female population from circulatory diseases from 1986 till 2008 years. These data are almost identical to the dates of male mortality. The only difference is clearly seen is number of deaths in different countries it is approximately 100 to 350 thousand. Men die more than women.

Fig. 27. Age-standardised mortality rates by cause of death from circulatory diseases in 1986-2008, females



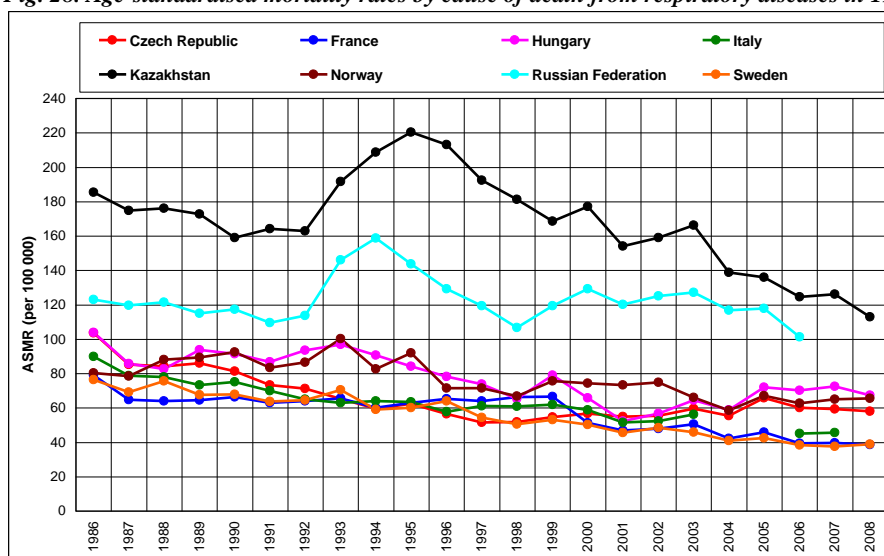
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Next two figures 28, 29 shows disease associated with respiratory of male and female in period from 1986 to 2008. The highest rate of dying in case of respiratory diseases is noted in Kazakhstan on 1995 year, registered a record number of deaths, which are around 220 per 100 000 people. The lowest average of deaths in case of respiratory diseases observed in France.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

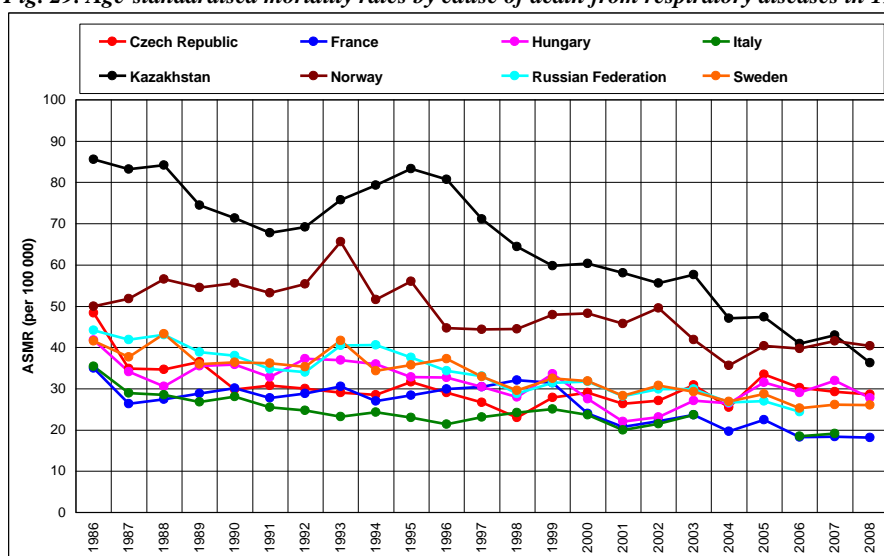
Fig. 28. Age-standardised mortality rates by cause of death from respiratory diseases in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 29. Age-standardised mortality rates by cause of death from respiratory diseases in 1986-2008, females



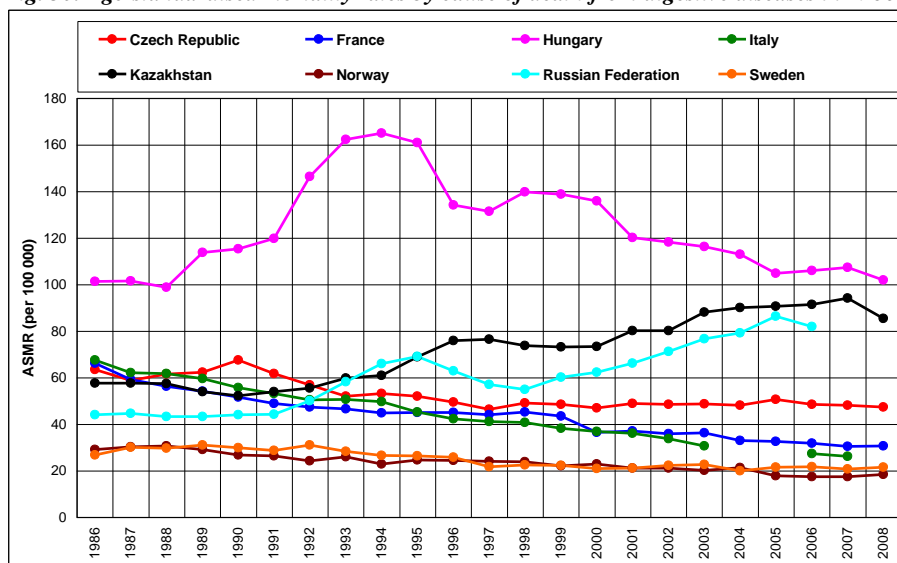
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Those figures 30, 31 show the mortality rate of digestive diseases at male and female population at mentioned countries. The highest rate registered in Hungary, followed by the countries: Kazakhstan and Russia. We can assume that in Hungary and Russia population abuse the alcohol and due to that we can see such kind of rate. But in Kazakhstan can be assumed the bacterial food poisoning. The lowest rate seemed in Norway and Sweden.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

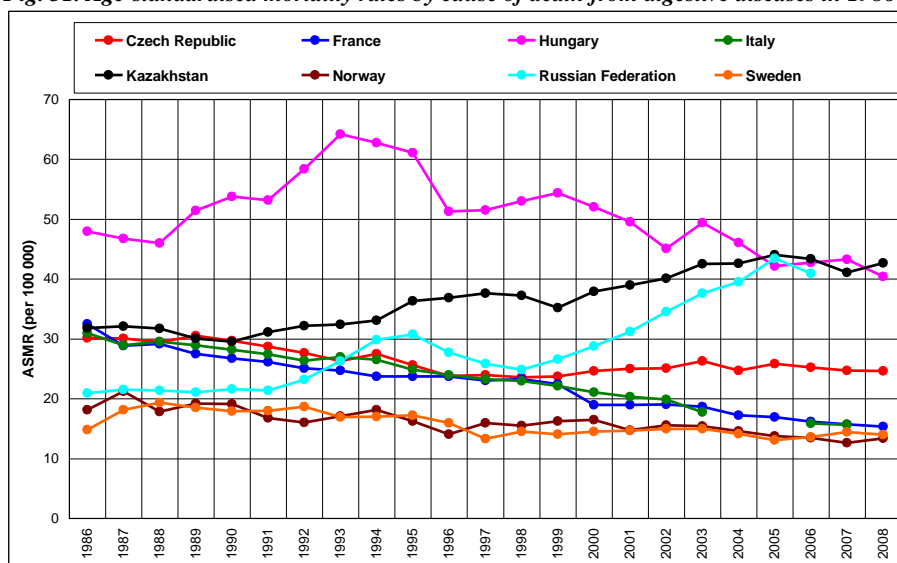
Fig. 30. Age-standardised mortality rates by cause of death from digestive diseases in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 31. Age-standardised mortality rates by cause of death from digestive diseases in 1986-2008, females



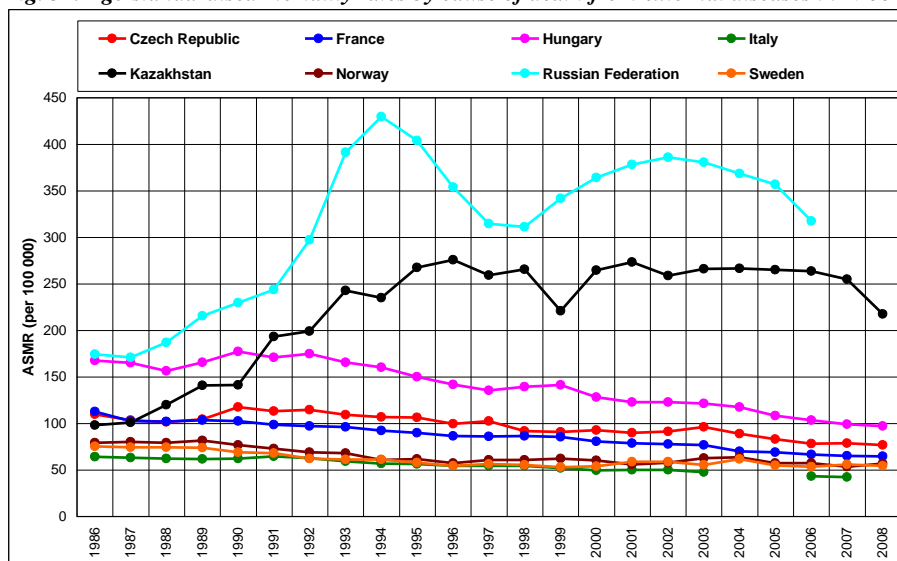
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Following two figures 32, 33 show on the rate of mortality on female and male population from the external disease on period 1986-2008 years. In Russia and Kazakhstan we can see the highest rate of dying people from external diseases.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

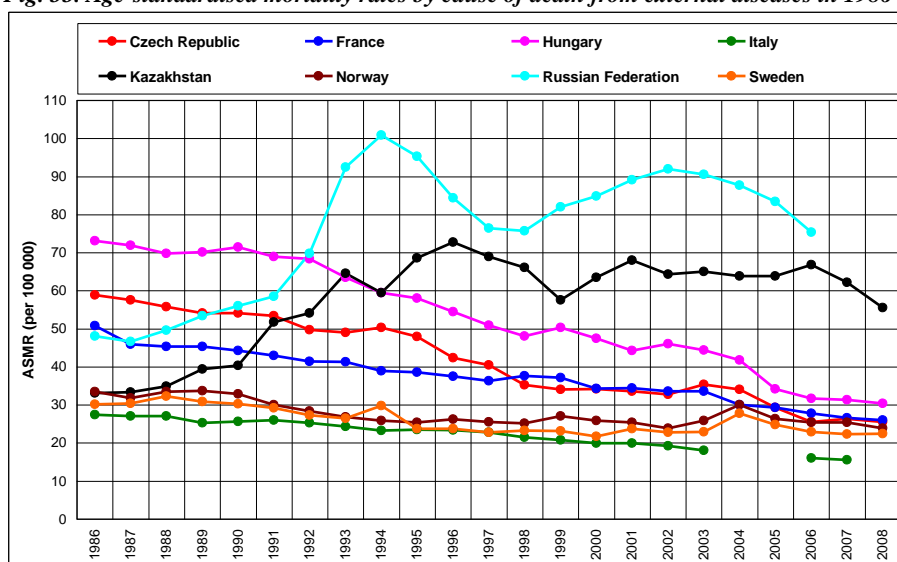
Fig. 32. Age-standardised mortality rates by cause of death from external diseases in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 33. Age-standardised mortality rates by cause of death from external diseases in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

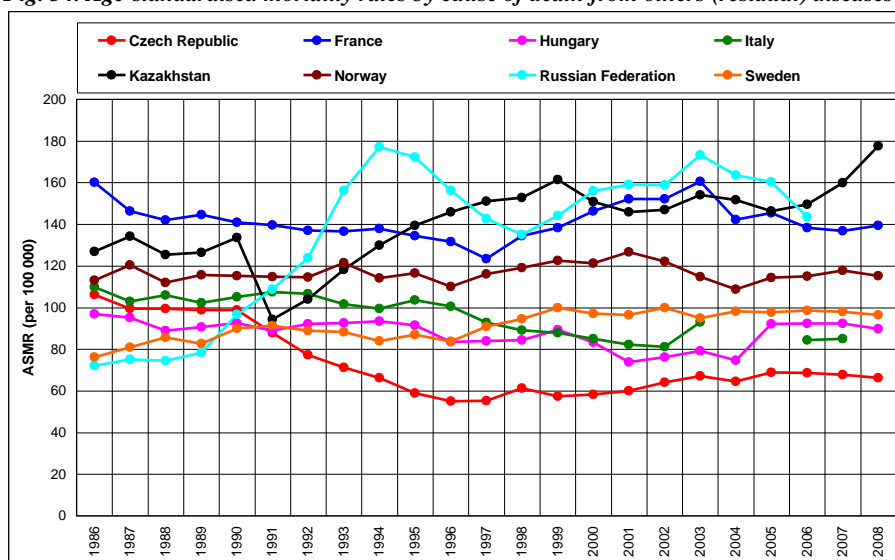
Source: Author's own calculations based on data from WHO mortality database

The highest point was matched in 1994 year. Probably this is due to rampant crime on that period. But I would like to note that on last years this trend markedly reduced. Most positive trend is showing countries Italy and Sweden.

On that figures 34, 35 we can see the average mortality rate of men and women from residual factors on period of 1986-2008 years. The most rate of mortality we can see on countries of Russia, Kazakhstan, France, and the lowest rate was surveyed in Czech Republic and Hungary. According to that graph we can say that residual factors have the same effect to male and female population.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

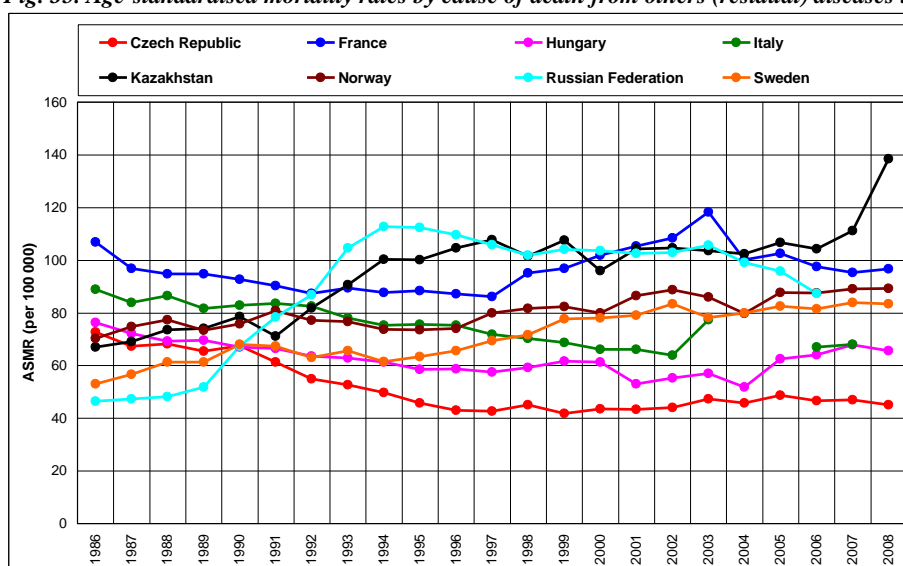
Fig. 34. Age-standardised mortality rates by cause of death from others (residual) diseases in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 35. Age-standardised mortality rates by cause of death from others (residual) diseases in 1986-2008, females



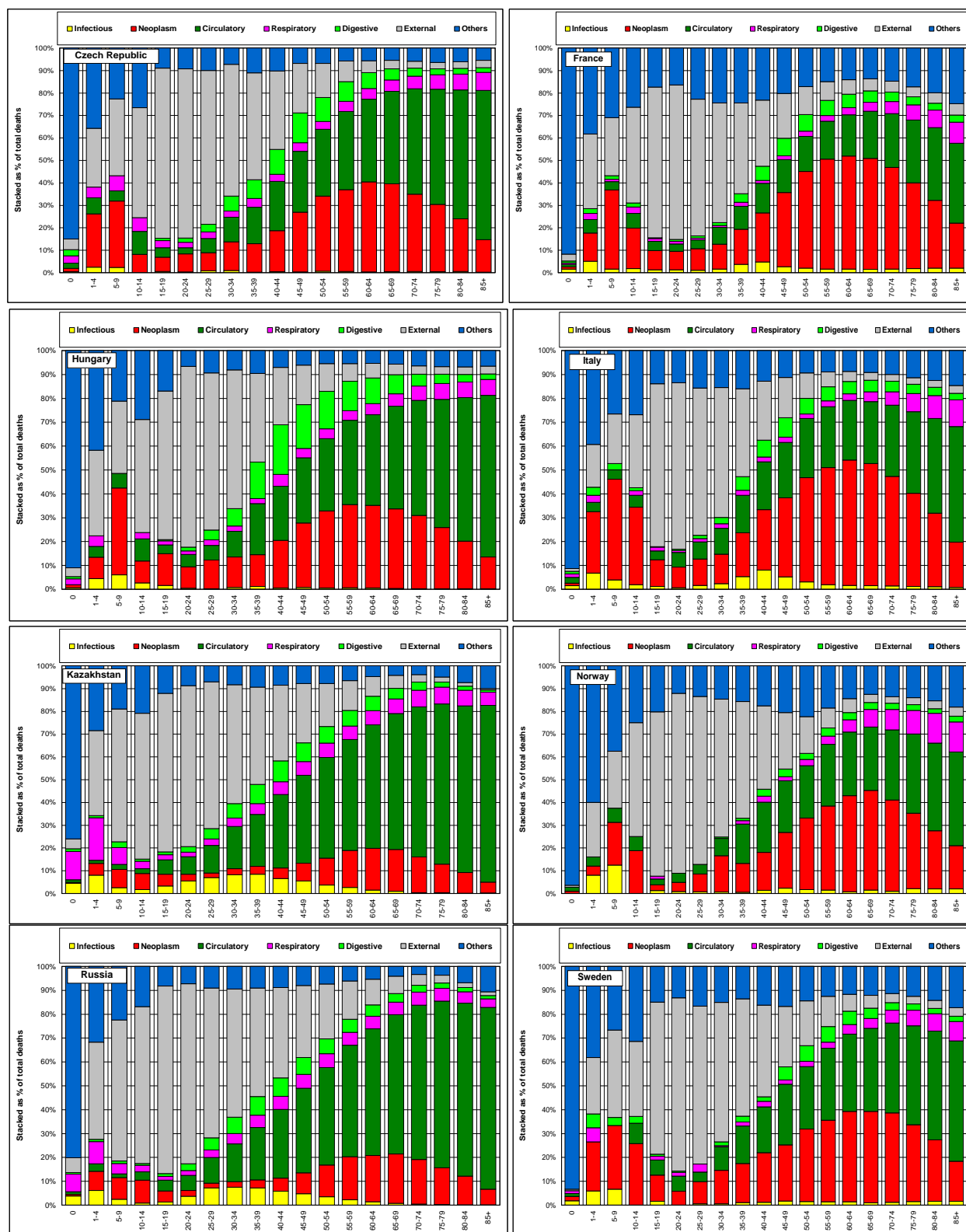
Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

That following figures 36, 37 show percentage of deaths from various common diseases of the male and female population the above mentioned countries in 2006 year. Overall trends indicate that the person male from birth till 14 years old more susceptible to death related to the other factors, external and neoplasm. Further mean the general trend shows that the male populations from 15 to 44 years are particularly susceptible external facts of deaths and circulation cases. Male population of 4 -9 years are subject to neoplasm diseases. The rate of mortality to female population from birth till 14 years old, shows that the more popular cause of death is others, external and neoplasm diseases. After from 15 till 44 those cases are external, circulatory and neoplasm diseases. Female population after 44 years old are often subject to illnesses based on circulatory and neoplasm diseases. More common causes of death both for men and women are external, circulatory and neoplasm diseases.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

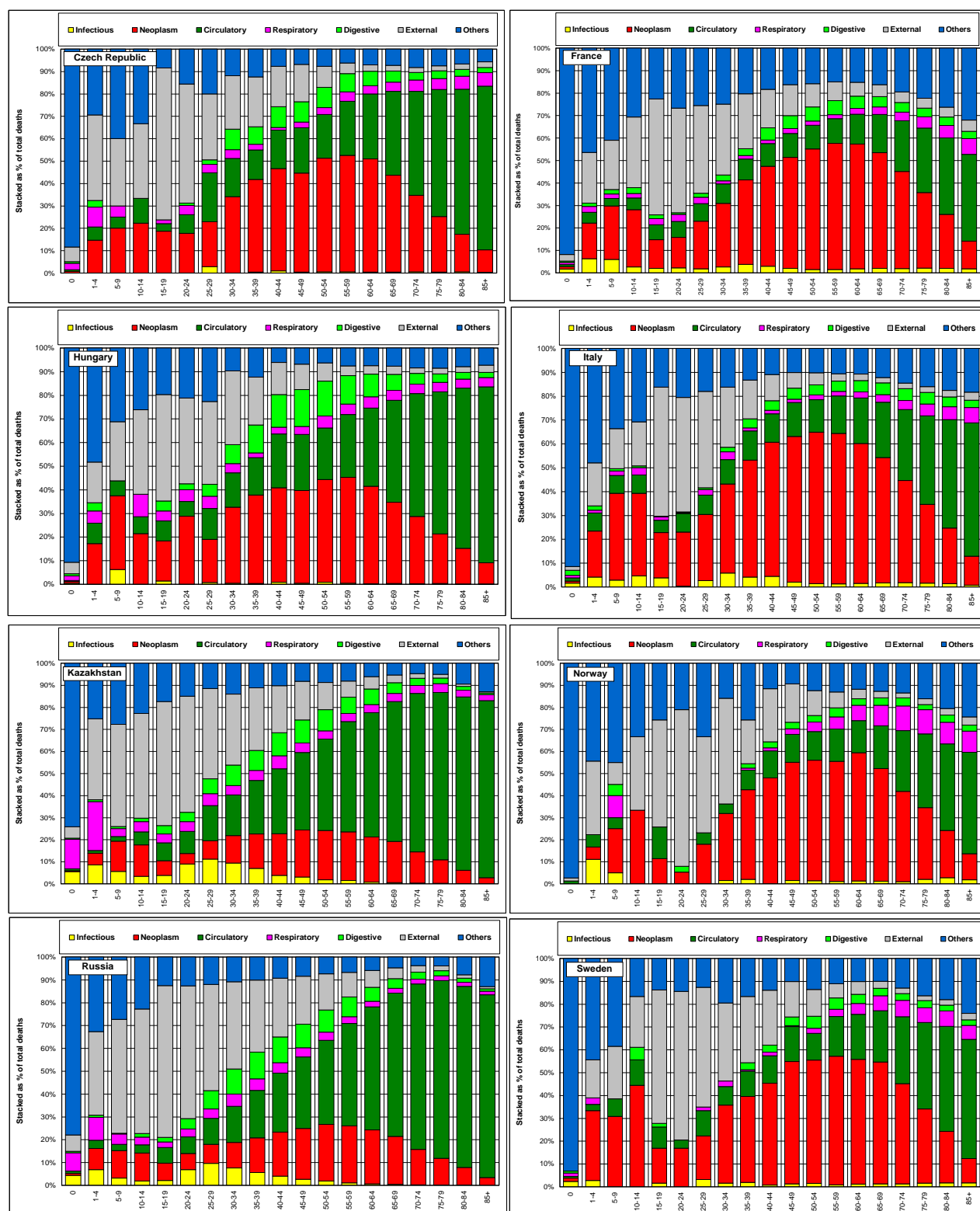
Fig. 36. Number of deaths by main causes of death of mortality structure in the selected countries for males, 2006



Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig.37. Number of deaths by main causes of death of mortality structure in the selected countries for females, 2006



Source: Author's own calculations based on data from WHO mortality databases

Chapter 8

Analysis of mortality trends by major cancer sites in the selected countries between the period of 1986-2008

In this chapter I would like to make a review of a lot of information about cancer's trends, about the mortality as a reason of cancer disease, about the development of cancer and methods to stop and control it in nowadays.

In this section, I compare the reasons for deaths from cancer of the reasons for deaths from other diseases in the Republic of Kazakhstan: infectious diseases, internal and digestive diseases, circulatory system. The thesis presents the change in the number of deaths by cancer of the disease in different age categories during the period from 1981 to 2008. Besides, presented in more detail in the study selected the most common types of cancer.

Malignant neoplasm of trachea, bronchus and lung

The most popular disease in the world among people is a disease like cancer. Each year, the number of cancer patients is growing. For example, such an increase can be traced: in women each year become ill at an average 330.000 and 900.000 men. This statistic confirms that the basis of increased mortality is a disease like cancer.

In worldwide there are 45 % of cases of cancer. In the Northern Europe there are about 70 %. More of all cases are caused by cigarette smoking, including environmental tobacco smoke. For example, 80 % of people with disease as cancer have especially lung cancer. To incidence air pollution and some occupational exposures make a minor contribution. There is no effective treatment in this case. Doctors in case of lung cancer gave as prognoses that less than 15 % of patients have the five-year survival rate.

These tumours arising from epithelia of lungs or bronchi, or the trachea, and this type of cancer always exclusively involves carcinomas.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Nowadays lung cancer is the most common and malignant sickness in the world. It is one of the most main reasons of death from cancer, particularly amongst men. The development of cancer especially of lung cancer has increased rapidly and it now according to statistics accounts for an estimated 901,746 new cases each year among men and 337,115 among women.

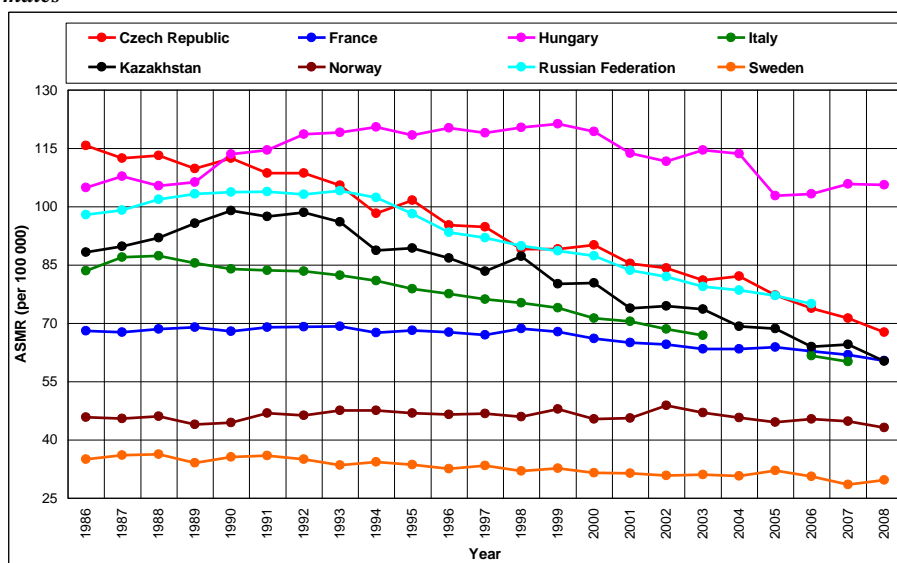
In the EU the highest rate of cancer death in males has the cancer of the trachea, bronchus and lung (lung cancer). And females have this type in the third highest rate. Overall, the mortality rate for lung cancer was around five times higher in males than in females. It is about 50.3 per 100,000 among men and 10.3 per 100,000 among women. The national mortality rate in all countries is higher in males than in females. There were considerable variabilities in the rates between countries among males.

These difference we are able to find and understand if we go through the smoking history. The highest rates are in the former socialist economies of Europe: the Czech Republic and Hungary. Methods about lung cancer rates represent high and low levels. One is for tobacco smoking and another is for control of tobacco use.

As shown in the chart, Kazakhstan is situated in diameter and does not deviate much from other countries. Positively, the number of diseases in Kazakhstan decreases.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

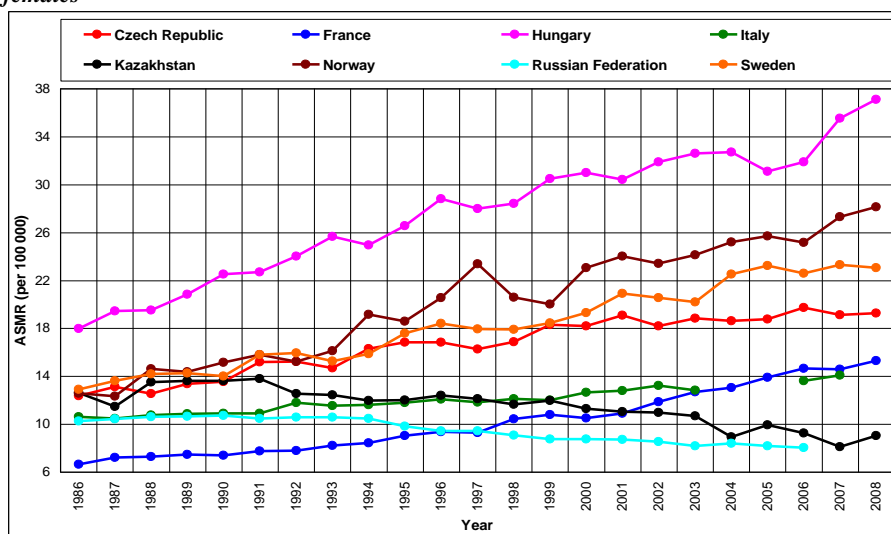
Fig. 38. Age-standardised mortality rates by malignant neoplasm of trachea, bronchus and lung in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 39. Age-standardised mortality rates by malignant neoplasm of trachea, bronchus and lung in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of colon, rectum and anus

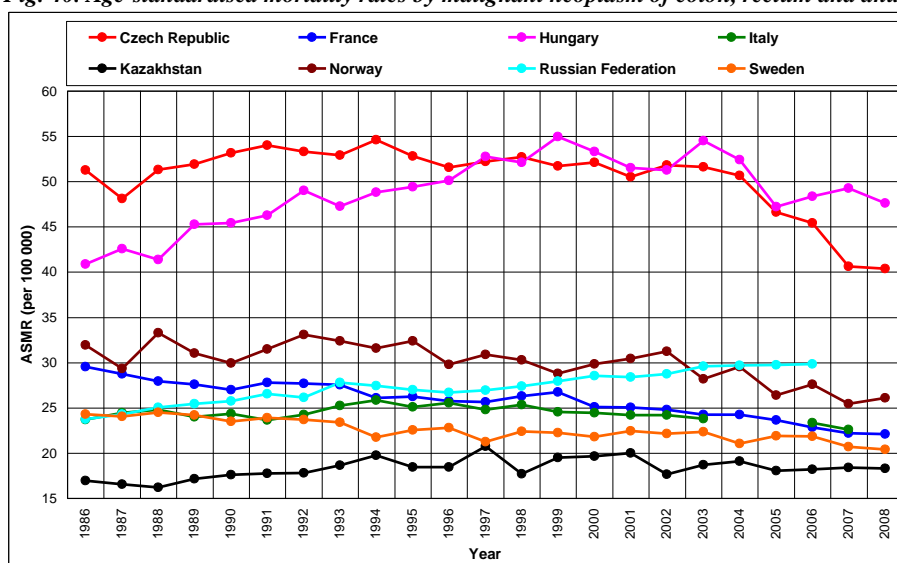
In developing countries such type of cancer as cancers of the colon and rectum is rare. But in the affluent societies this type of cancer is the second among the most frequent malignancy. According to statistics, there are more than 940.000 cases per year of new cases with such type of cancer worldwide. One of the most important factors, which make the development of cancer, is lifestyle involving a diet rich in fat, which is combined with low physical activity and refined animal protein and carbohydrates. If you want to decrease risk of cancer's development, you should increase fruits and vegetable consumption and decrease meat consumption. The earliest studies because of sequential genetic alterations mediate development of colon cancer have already changed being mutation of the APC gene. A genetic basis has usually familial

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

clustering. Familial adenomatosis polyposis and hereditary non-polyposis colon cancer are the typical syndromes. For early detection colonoscopy is the most reliable means. Progressively improved treatment has resulted in a five-year survival rate of about 50 %. The majority of cancers are adenocarcinomas. It is including the colon and rectum, and accounts for more than 90 % of all large bowel tumours (World Health Organisation 2003).

Regarding to neoplasm of colon, rectum and anus, so here it is necessary to say that Kazakhstan is doing far better than other countries.

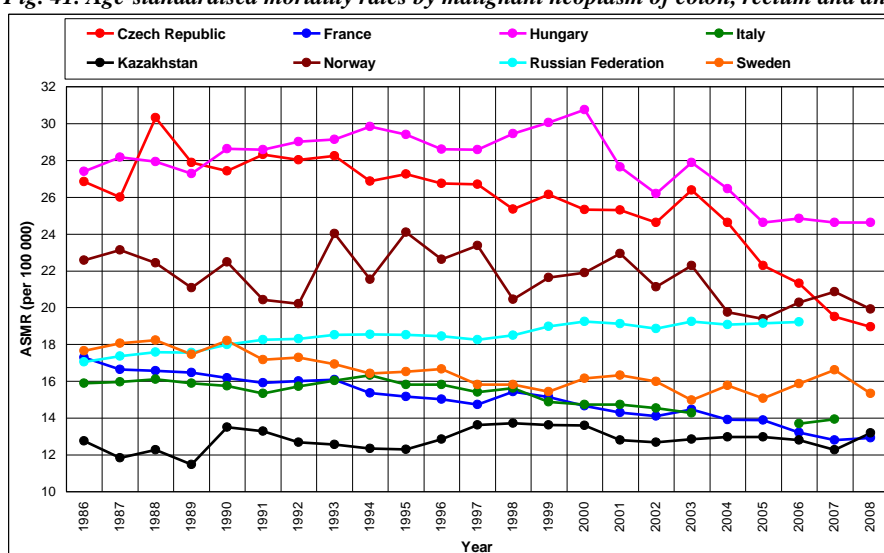
Fig. 40. Age-standardised mortality rates by malignant neoplasm of colon, rectum and anus in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 41. Age-standardised mortality rates by malignant neoplasm of colon, rectum and anus in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

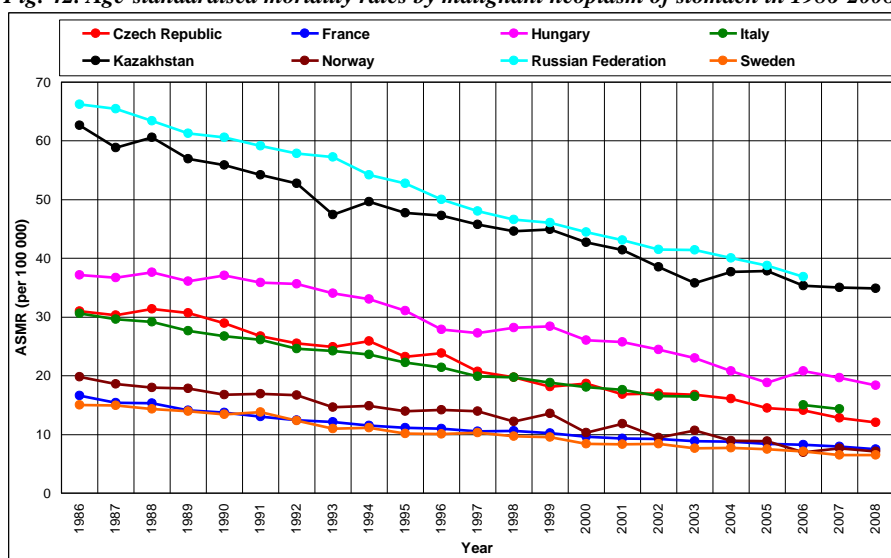
Malignant neoplasm of stomach

In Kazakhstan the second of the most common cancers globally is the stomach cancer. It is also the second among males and the fourth most common among females. Stomach cancer in the southern Kazakhstan and in the western Kazakhstan has the highest incidence rates in comparison with all other types of cancer. Average ratio between cases among men and women is about 1.9: 1. In 2008, there were 2.726 newly diagnosed cases of stomach cancer.

In the world the cancer of the stomach is the most common among all cancer's diseases. It is calculated that usually per year new people with this disease are 870.000 new cases. On the first place in mortality from cancer is mortality because of lung cancer and on the second place is mortality because of stomach cancer. Incidence is declining worldwide. In most European countries during the past 50 years this tendency has fallen by more than 60 %. It is because of markedly decreased consumption of salt- reserved food. Also this trend is mainly due to, increasing avoidance of a high-salt diet and availability of fresh vegetables and fruits. This type of consumption must be during the whole year. For example, chronic atrophic gastritis are caused because of infection with *Helicobacter pylori*. This factor is considered in the development of stomach cancer. Doctors calculated that usually less than 30 % of patients with such disease have five-year survival rates and even less.

Strangely enough, I found that Kazakhstan is the one of the first places in MALIGNANT neoplasm of stomach. The worse thing is just the Russian Federation. Due to the relative proximity of the two countries it can be assessed that the main reason of cancer is diet (World Health Organisation 2003).

Fig. 42. Age-standardised mortality rates by malignant neoplasm of stomach in 1986-2008, males

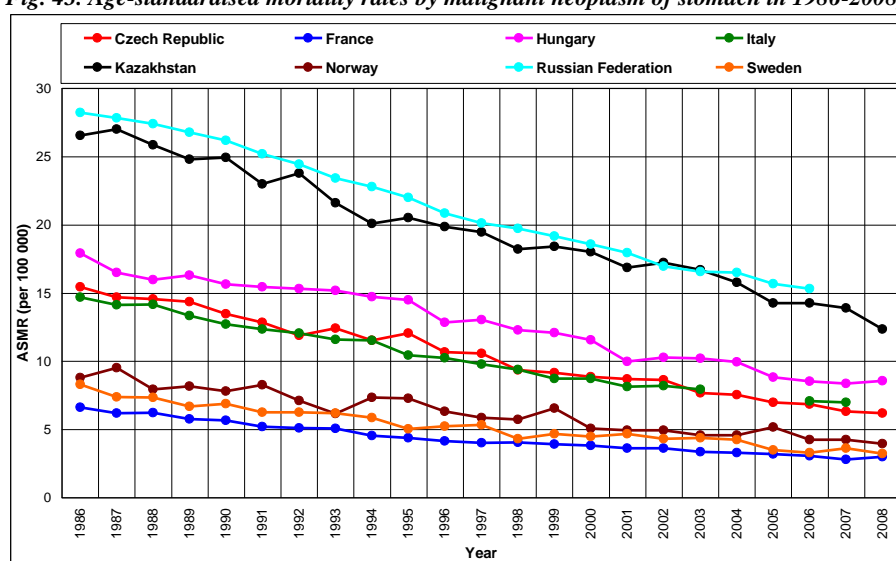


Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 43. Age-standardised mortality rates by malignant neoplasm of stomach in 1986-2008, females



Notes: Missing data

for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of prostate

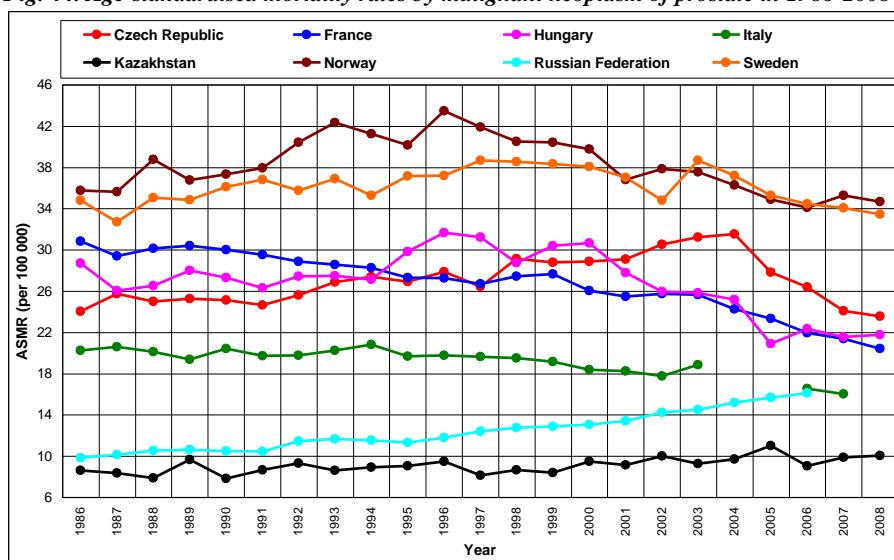
In developed countries mainly among older men the mortality because of prostate cancer accounts for about 200.000 cases annually in the world. This is because of low physical activity and such risk factor as caloric intake. The lower risk have the Asian men, white men have an intermediate risk, and the highest risk have black men have. Recorded incidence is increasing in many countries, partly as a result of screening for elevated serum levels of prostate-specific antigen.

Testicular cancer mainly affects young men, with close to 50.000 new cases each year worldwide. This tendency is increasing in many developed countries, but it is difficult to find the solution, because its etiology is mostly unknown. Doctors calculated that patients with this disease are able to leave longer than people with other types of cancer. So, the five-year survival rate is higher than 95 %. But people must use cisplatin and have chemotherapy. There are a lot of cases, where it is possible to stop the developing of cancer and to be healthy, but all this is after long procedures with chemotherapy.

Kazakhstan has the lowest rate among selected countries. In this type of graph can be said this type of cancer is occurred only in men. (World Health Organisation 2003)

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 44. Age-standardised mortality rates by malignant neoplasm of prostate in 1986-2008



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of female breast

Breast cancer is the most common result of mortality than other types of cancers. In the world there is no country with a really low level of such type of cancer. It is calculated that the rate of people with such disease as breast cancer in the EU was 20.6 per 100.000. According to statistics, breast cancer is situated one the fifth place of all cancer mortalities.

There are more than one million new cases of breast cancer in the world per year, and it is the most common affecting women malignancy. It is the greatest risk for affluent societies. It is about incidence rates of 80 per 100.000 population per year. All this is happened because of a lot of etiological factors. The worldwide cancer epidemic has its own reproductive history, for example early menarche, late or no pregnancy at all. But not only this affects women. Also Western lifestyle is very unhealthy. Now I am talking about lack of physical activity and high caloric diet.

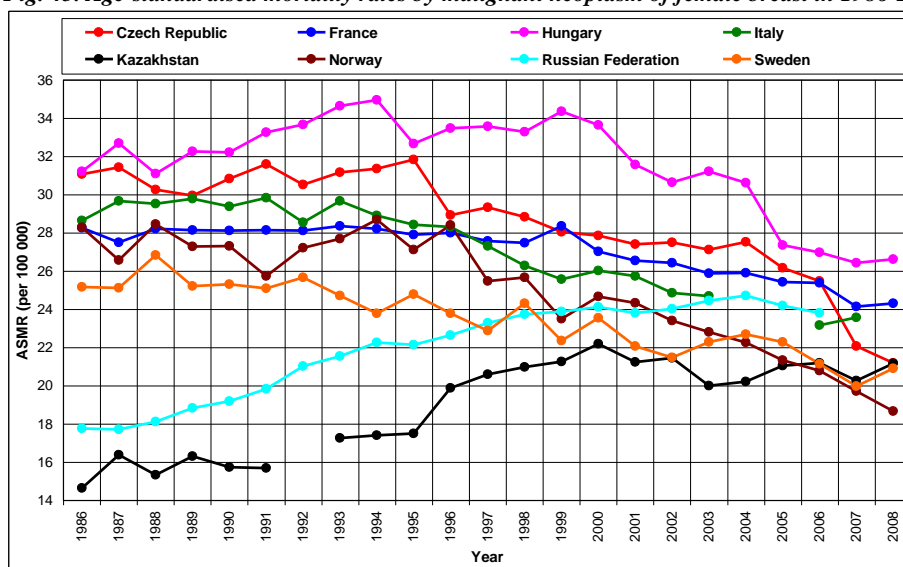
Now the mortality rates of breast cancer started to decline in such countries as Western Europe, North America and Australia. But this is not because of right diet full of fruits and vegetables, but because of improvements in early detection, for example tamoxifen and chemotherapy.

According to doctors, 70% of people with this disease are able to live and reach five-year survival rates in most developed countries. Because of new technologies and development in science it is possible to recognize the breast cancer absolutely in the beginning and that is why to decrease the mortality to 30%. Of course all this is because of screening trials of mammography, but it is limited, because this evidence could be just in population-based countrywide screening programmes.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

In a taken time period Kazakhstan had low rates, but now in Kazakhstan as in the Czech Republic rates of breast cancer mortality are extremely growing (World Health Organisation 2003).

Fig. 45. Age-standardised mortality rates by malignant neoplasm of female breast in 1986-2008



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of lymphatic and haemopoietic tissue

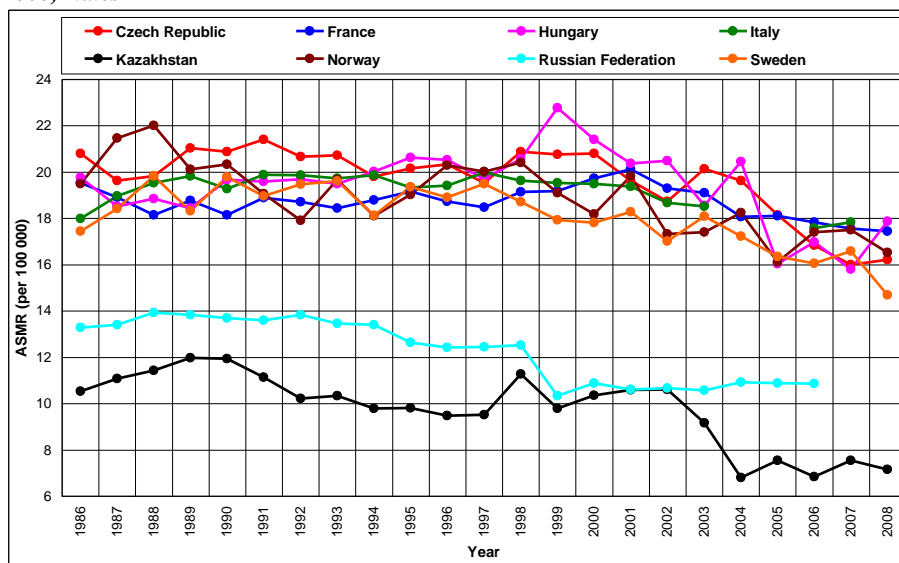
Hodgkin disease is diagnosed as malignant lymphomas. Sometimes it could be non-Hodgkin lymphoma. In developing countries mainly Hodgkin disease is able to afflict children and the elderly, but in developed countries it is able to afflict young adults. There are diagnosed more than 62,000 of new cases per year. This disease is spreading and developing in the whole world nowadays. Mostly in developed countries are diagnosed more than 280,000 new cases every year.

In some areas in Africa where there is malaria, was found Burkitt lymphoma as a subtype of malignant B-cell lymphoma. Now it is common in Africa. Also B-cell lymphomas may be caused by immunosuppressant. These two lymphomas are associated with the Epstein-Barr virus. People with this Hodgkin disease have a chance of 70 % to reach a five-year survival rate and for non-Hodgkin lymphomas has increased to 60-70 %.

A heterogeneous group of neoplasms of lymphoid tissue is covered with the term lymphoma. Traditionally, lymphomas are categorized as Hodgkin disease and non-Hodgkin lymphoma. Differences of it are in the behaviour and response to treatment. There is a range of diverse subtypes within each of these two entities.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

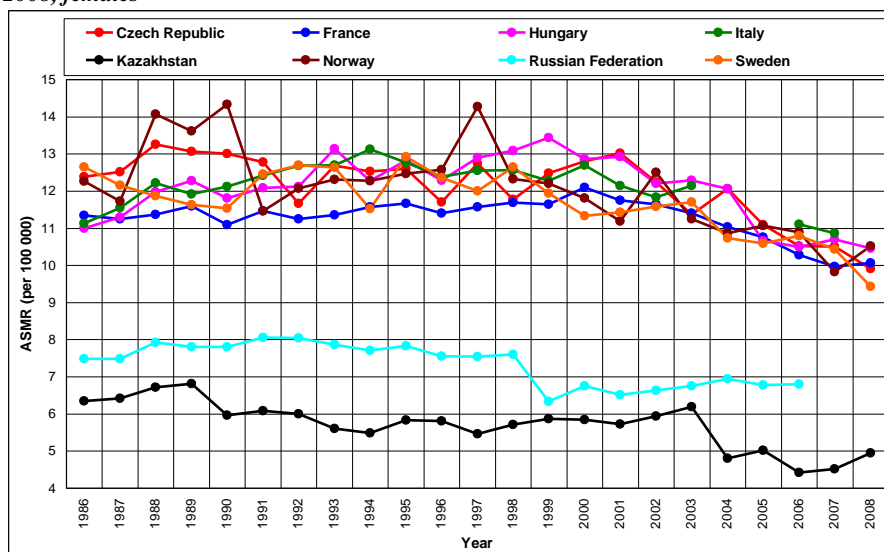
Fig. 46. Age-standardised mortality rates by malignant neoplasm of lymphatic and haemopoietic tissue in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 47. Age-standardised mortality rates by malignant neoplasm of lymphatic and haemopoietic tissue in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of lip, oral cavity and pharynx

Oral cancer is such type of cancer that encompasses cancers arising at all sites within the oral cavity and pharynx. This may obscure important variations in both the mortality and the effect of aetiological factors for the different cancer sites.

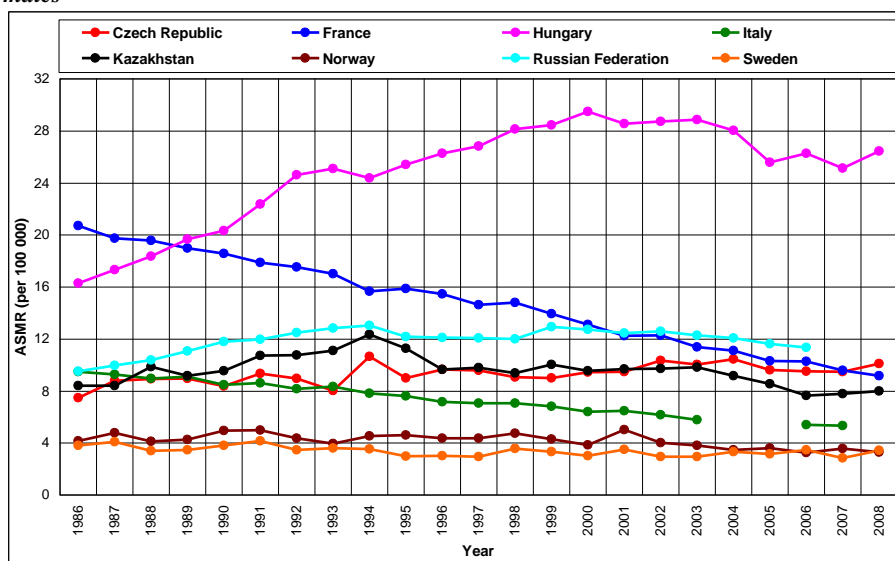
In the EU the mortality rates for above mentioned cancers were about 4% of the rate for all cancers in males and about 1% of that in females.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

In 2000, the highest rates in men were in Hungary (29.47). Also I would like to add some more statistics about men rates in different countries: France (13.1), Russia (12.72). Kazakhstan (9.52) and the Czech Republic (9.43) are approximately on the same level. The lowest rates were found in Norway (3.85) and Sweden (3.0).

In Hungary in 2000 this rate in female was 4.32. It was relatively little variation in comparison with the other countries. The ratio between the male and female rates in each country varied widely, from around 2:1, for example Norway and Sweden. This rate in Hungary, France and Russia is up to more than 7:1.

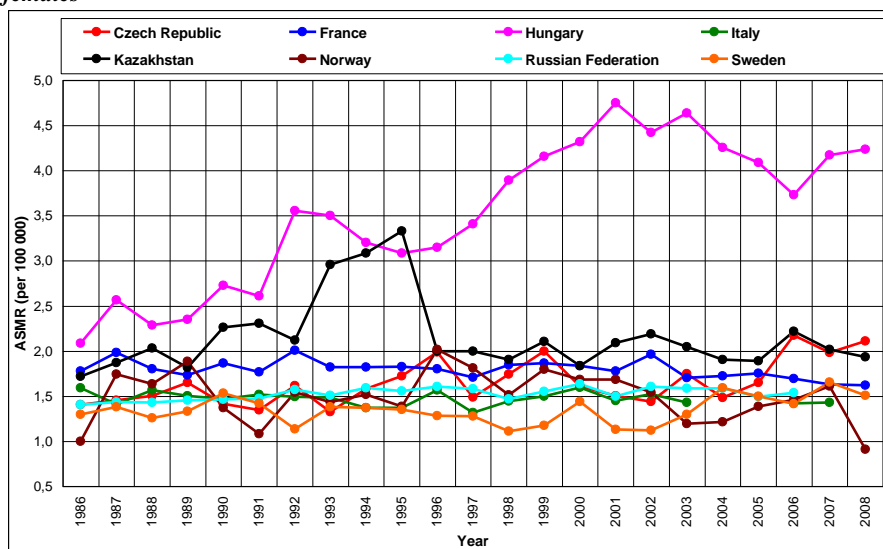
Fig. 48. Age-standardised mortality rates by malignant neoplasm of lip, oral cavity and pharynx in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 49. Age-standardised mortality rates by malignant neoplasm of lip, oral cavity and pharynx in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

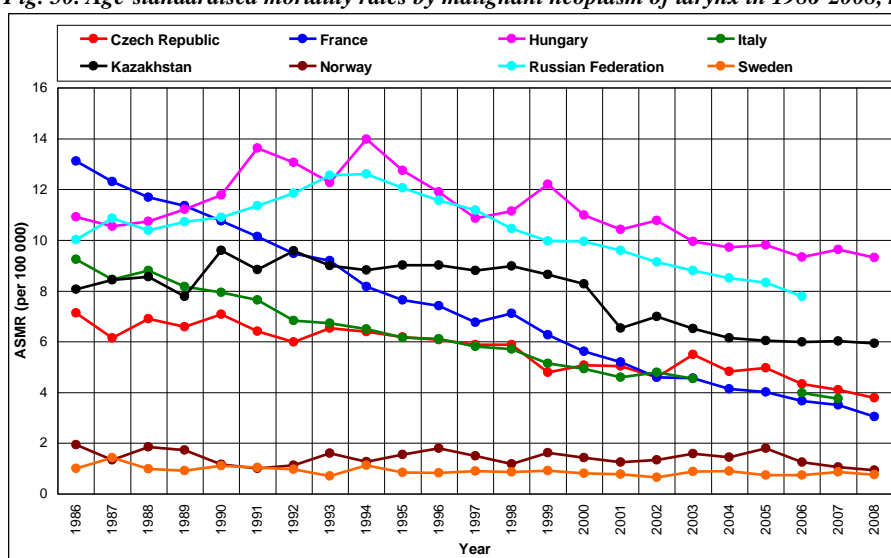
Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of larynx

There is an organ in the neck of humans, which is called the voice box or the larynx or plural larynges. Also reptiles (incl. birds), amphibians and mammals have it in the neck. It is involved in sound production, breathing, and protecting the trachea against food aspiration. These vocal folds are situated in such place - below where the tract of the pharynx splits into the trachea and the esophagus.

Person has a high chance to be healthy or to leave long life if this disease was recognized at an early stage. This rate of mortality because of this type of cancer is little bit over 2 % of the rate for all cancers in males, but less than 0.5 % in females.

Fig. 50. Age-standardised mortality rates by malignant neoplasm of larynx in 1986-2008, males

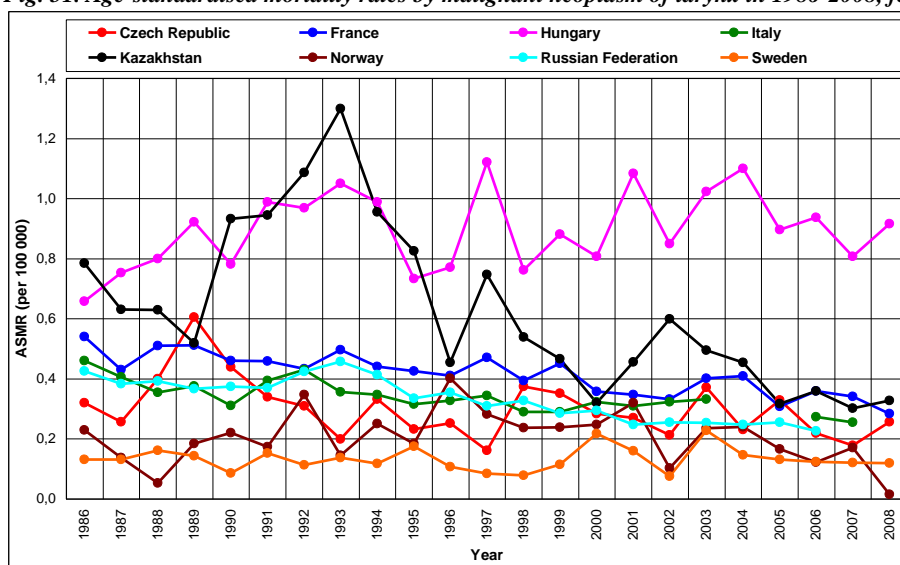


Source: Author's own calculations based on data from WHO mortality database

Cancer of the larynx in males (3.9 per 100.000) was much commoner overall than in females (0.3 per 100.000). The national mortality rate was higher in males than in females in all countries in the world. There were consistently very low national rates in females. But there was considerable variability in the rates between countries in males. Throughout Europe such differences may contribute partially to the variation in mortality from this cancer. According to statistics, in EU the mortality rate because of the larynx cancer is 15 times higher in males than in females.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Fig. 51. Age-standardised mortality rates by malignant neoplasm of larynx in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Malignant neoplasm of oesophagus

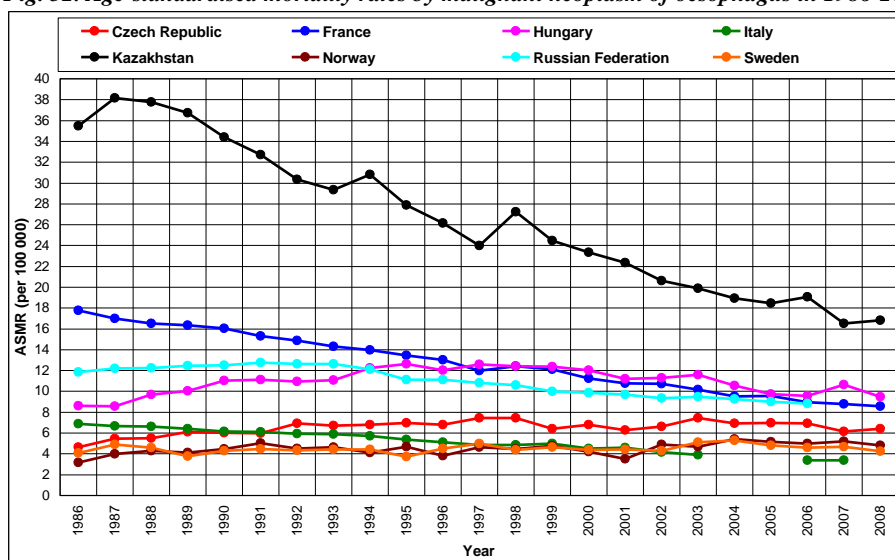
This type of cancer is the sixth in the world among all other types of cancer. Cancer of the oesophagus has more than 400,000 cases per year. The highest rates are in South Central Asia and Western Asia. This type of cancer is the most common in developing countries. Squamous cell carcinoma is associated with tobacco smoking, alcohol consumption and very hot beverages and malnutrition. It was occurred in white men from highly developed countries. Adenocarcinoma is the one the most important etiological factors being obesity and chronic gastrooesophageal reflux. But it is very difficult to diagnose this cancer, and that is why the most cancers of the oesophagus are detected at an advanced stage. Chances to reach a five-year survival rates are less than 15 %.

In comparison to countries of the Commonwealth of Independent States (CIS) Kazakhstan is the country with the highest rates of oesophageal cancer. If we calculate all cancer cases we will find that the incidence of oesophageal cancer is 5.1 % of cases among men and 4.1% of cases among women.

This graph surprised me quite - Kazakhstan is on the first place. The reason is that Kazakhstan with other countries of Central Asia is falling into the risk region, residents who have predisposition to a specific type of cancer (<http://www.lood.ru/digestive-diseases/oesophageal-cancer.html>).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

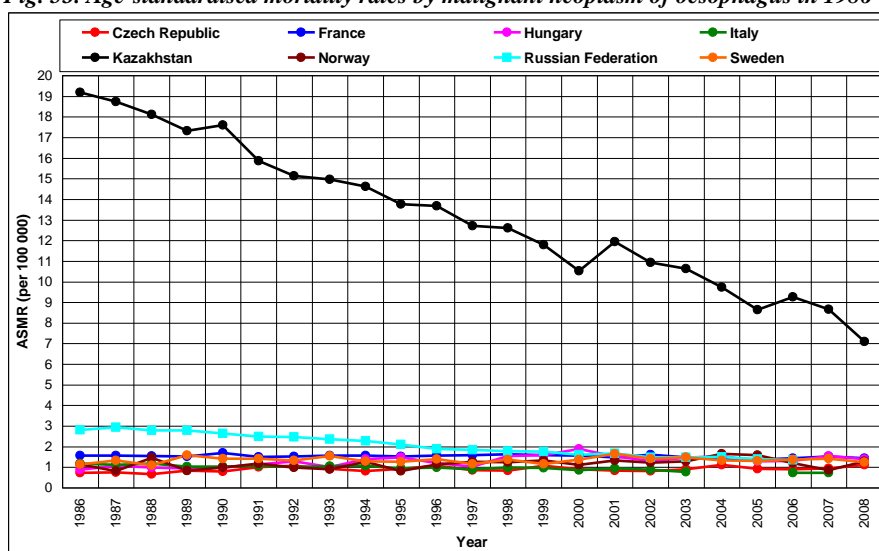
Fig. 52. Age-standardised mortality rates by malignant neoplasm of oesophagus in 1986-2008, males



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Fig. 53. Age-standardised mortality rates by malignant neoplasm of oesophagus in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Missing data for Kazakhstan 1992; Data for the Russian Federation is available until 2006

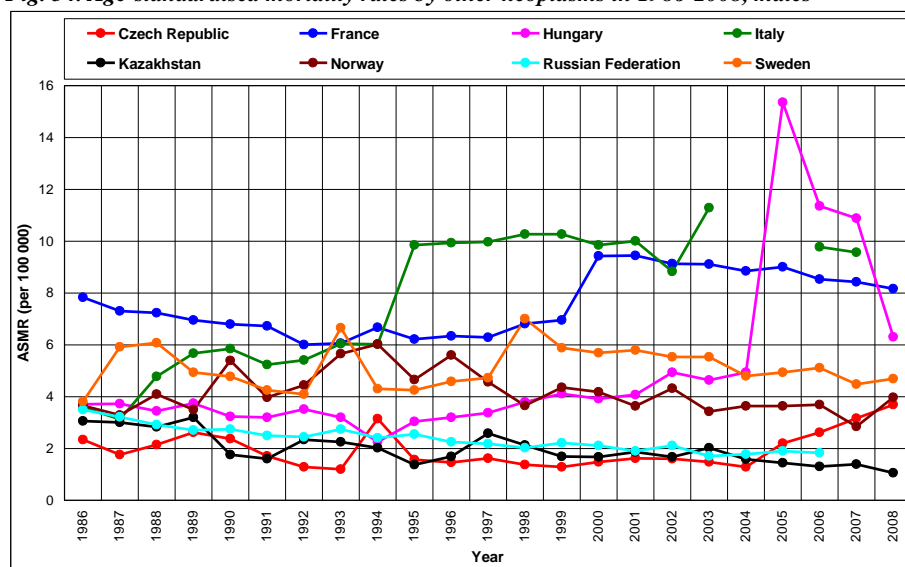
Source: Author's own calculations based on data from WHO mortality database

Other neoplasms

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

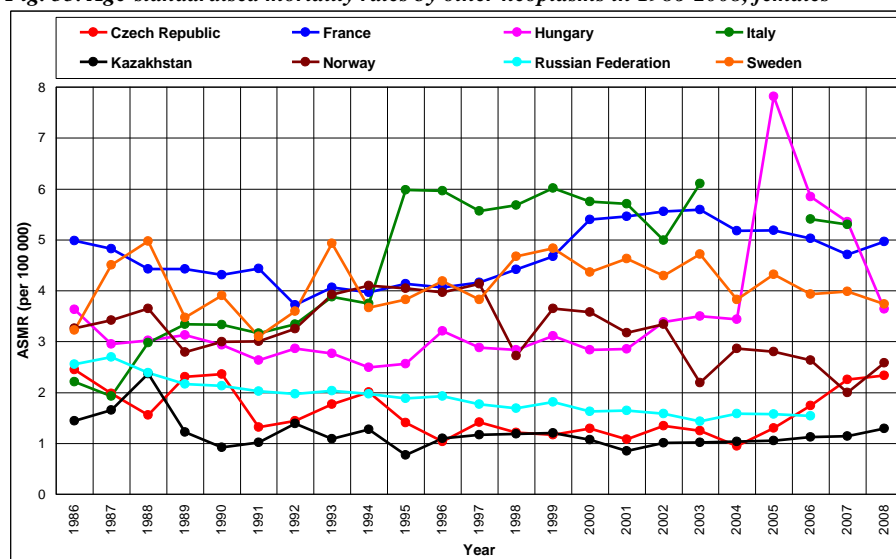
To have information about rates, patterns, development and features of other neoplasms or sickness is very important. Any information may play a great role in the process of treatment. Also it is needed to compare results between different countries and regions, because such elements and hormones that make spreading and development of cancer may represent high proportions of the rates for all combined cancers. Also it is important to understand that the rates for some types of cancer may be lower than they really are according to tests and researches.

Fig. 54. Age-standardised mortality rates by other neoplasms in 1986-2008, males



Source: Author's own calculations based on data from WHO mortality database

Fig. 55. Age-standardised mortality rates by other neoplasms in 1986-2008, females



Notes: Missing data for Italy 2004-2005, 2008; Data for the Russian Federation is available until 2006

Source: Author's own calculations based on data from WHO mortality database

Chapter 9

Causes of cancer and policies for prevention

In this chapter I would like to make a resume of the main reasons of appearance such disease as cancer and try to understand what to do to stop its spreading in the World. I would like to concentrate my research on that factors or determinants of this sickness, which are able to be controlled in case to stop the development of cancer. It is very important to understand clearly, what factors or determinants of this sickness have such features as ability to be changed or even modified because of environment, people's activities, habits, way of life.

In my current thesis step by step I will determine these factors, which cause on cancer's appearance, developing and spreading, and also according to the European Code Against Cancer I will take into account the method, how to prevent cancer. And of course I will stress the importance of regular control as a basement of struggle with cancer.

9.1 Key lifestyle risk factors for cancer

Tobacco smoking

One of the most important and understandable reasons of cancer's appearance as a disease is tobacco smoking. According to data, made by experts and scientists all over the World, in one cigarette there are more than 4000 elements, and 40 elements from them have carcinogenic features, for example, acrylonitrile, 4 – aminobiphenyl, 2 – naphthylamine, benzene, cadmium, benzo(a)pyrene, and chromium (IARC - 1986, IARC - 2004, Hecht - 2005).

It is reported everywhere and it is not a joke, that in the countries with developed economy and science there are around 30% of all 100% cancer cases, which are related exactly to tobacco smoking. If we combine countries with developed and developing economies we will be able to face in with the other result with amount of 16%.

Tobacco smoking we are able to understand not only as a great risk for exactly smokers or active smokers, but also for passive smokers, who unfortunately may breathe this smoke. The first and the main method how to stop the prevention of cancer and to decrease the index of premature death is to stop smoking (Boyle et al. 2004).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

According to researches, which were held in Japan, North America and Europe from 87% to 91% among men and from 57% to 86% among women of lung cancer diseases are associated with cigarette smoking. To continue with statistics I need to stress that from 43% to 60% among humans of cancer diseases are associated with the influence of tobacco, either in combination with alcohol or without it.

These cancers arise in the oral cavity, larynx, and in the cavity of the esophagus. Finally, the meaning share of cancers of the pancreas and the urine bladder, a smaller proportion of the stomach cancer, nose and cervix cancers, kidney cancer, and myeloid leukemia, are also reasonably associated with tobacco smoking (Boyle et al., 2003).

The duration of the latent period means that these cancer's diseases related to tobacco-smoking, which we are able to notice in current days, are associated with tobacco-smoking model in the previous few decades.

The augmentation of the risk of cancer risk is sharply reduced or even stopped, because of reduction of smoking or even quitting. The bonus of tobacco smoking is clear after five years and it is more apparent and understandable over time (Godtfredsen and Pisinger, 2007).

The distribution and quantity of the effect of tobacco smoking in Europe, is particularly anxiety (Costanza et al. 2006). The one of the largest manufacturers and major exporters of cigarettes in the world is the European Union. The highest results of indexes of tobacco smoking and dependence on it are in the Eastern Europe and in the Central Europe (Boyle et al., 2004).

By the way according to the data and to the report from 2007 about to control the usage of tobacco in Europe we are able to say that rates of smokers between men and women are totally different. Men are 40% and women are 18%. And unfortunately now situation is changing not to good, but even to the worth. The rate of men-smokers is decreasing, but the rate of women-smokers is in a contrary increasing, for example, in the Eastern Europe. Now it is a tragedy, because those cancer risk-factors are very dangerous for women (Costanza et al. 2006; Mucha et al. 2006).

A huge concern is the fact that in many parts of Europe, the prevalence of smoking remains high among general practitioners. On the contrary a way of life of doctors should be exemplary in terms of health, rather than destructive. Therefore, such a negative figure should be a target for immediate action.

The number of deaths from cancer of the lung, bronchus and trachea can be used as an indicator of the number of smokers who die prematurely. And also as a marker of past trends in population exposure to tobacco smoke. These figures show a clear difference in cancer risk between men and women. Age-standardized mortality rate in 2007 was 65 per 100.000 population among men and 13.8 per 100.000 among women (WHO 2004). Trend analysis provides a fairly optimistic outlook.

Since the early 1990s there was a decrease in mortality from cancers associated with tobacco-smoking among the male population. Thanks to the anti-tobacco campaigns, which are

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

held in many European countries, has become markedly apparent decrease in smoking prevalence among men since the early 1980s. This figure reflects the growing prevalence of smoking among female population since the early 1980s in general.

Besides cancer, smoking tobacco is the result of many serious diseases. For example, cigarette smoking leads to heart disease, stroke and chronic obstructive pulmonary disease (COPD or chronic bronchitis) (Boyle et al., 2004). Tobacco smoke exhaled by smokers, is usually in the environment. Smokers should bear a great responsibility for the harmful effects on those who inhale the smoke. This is a passive smoke and increases the risk of lung cancer (Boyle et al. 2003), as well as heart disease and respiratory disease. Passive smoke is especially harmful to young children.

Smoking during pregnancy has important consequences for the offspring. This increases the risk of stillbirth, as it is associated with low birth weight of baby at birth. Also it has a great influence on subsequent mental and physical development of children. After birth, the both parents smoking increases the risk of the child's respiratory tract infections, causes of severe asthma and leads to sudden death (Boyle et al., 2004).

Alcohol

In the etiology of cancer the alcohol consumption also plays a huge role. The risk of cancer increases with the amount of alcohol consumption. Scientists have not established a limit of alcohol drinking (the safe level of alcohol consumption). But there is an evidence that people who use alcohol every day are more prone to cancer than people who only occasionally use alcohol. For example, men who consumed two or more servings of alcohol per day have an increased risk of developing cancer of the esophagus, mouth or throat. For women it is enough just one alcoholic drink per day to join a high-risk group. Women who drink alcohol are more prone to getting diseases such as liver cancer, breast cancer and colon cancer. (Poschl and Seitz 2004; Boyle et al, 2003.).

The WHO European Region, compared with the world or with other region WHO has the highest alcohol consumption per capita. This rate is two times higher than the world average. Drinking alcohol is the third most important risk factor that leads to many diseases in all age groups in the region. In the first and second risk factors leading to death are high blood pressure and smoking. Among young people the highest mortality associated with excessive alcohol consumption. The index acquisition-related diseases alcohol consumption in Europe is twice the global average (WHO 2006). According to the Eurobarometer in relation to alcohol consumption (March 2007) reported that 75% of EU citizens say that they drank alcohol within the past 12 months. On the basis of statistical data, we can conclude that there is an increase in alcohol consumption, which is observed in all EU countries since 2003 (European Commission 2007).

Even if a person does not smoke and only drinks, alcohol consumption increases the risk of cancer of the respiratory tract and upper digestive tract. When a person smokes and drinks, the risk of cancer increases exponentially (Boyle et al., 2003).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

In addition to the above mentioned reasons, alcohol is also a major risk factor for other causes of death. In the EU among young people trauma (eg injured during leisure activities, traffic safety injury) is the leading cause of death (Petridou et al., 2007). Trauma is one of the main effects of alcohol.

In addition, the negative impact of alcohol can be during pregnancy. A small dose of alcohol has a negative effect on the central nervous system of the fetus and its development, which often leads to cognitive impairment in the postpartum period, to congenital malformations, and violation of the child's behavior. Alcohol can also cause cardiovascular disease, although it is more dependent on the dose of alcohol for a long time (well-known J-shaped curve) (Cook and Reuter, 2007; Boyle et al, 2003).

Diet and nutrition

Scientists have suggested that about one-third (30-40%) of the total number of cancer deaths may be related to content of the diet. It is not yet confirmed, but the study of this field is developing very dynamically. Hardly a week goes all the new and new information about the risk of developing cancer in the case of holding of a bad diet and malnutrition (Divisi et al, 2006;. Willett 2006).

The first phase of the study was devoted to the determination of substances in connection with the consumption of fat, especially natural fat, on risk of developing cancer. Experimental studies and results of environmental investigations pointed to the very positive effects. However, the significant association between fat intake and the risk of developing breast or colorectal cancer based on the results of retrospective and prospective epidemiological studies in humans have not found (Boyle et al., 2003).

Cereals high in fiber and whole grains have been determined on the basis of several European research as a way to reduce the risk of cancer of the gastrointestinal tract and colorectal cancer and other diseases. In order to confirm this theory, more researches are needed because not all of the results failed to re-obtain. (Willett 2006).

In Southern European countries (eg Italy) the sickness and mortality from many type of cancers is lower than in other regions of Europe. The reason for this is the Mediterranean food and a diet that includes food, rich in fish, olive oil, fruits and vegetables. All of these foods low in animal natural fats. Again, to confirm this theory it is important to have more studies (Martin-Moreno 2000 Willett 2006).

There have been many epidemiological studies on the fruits and vegetables. Studies have shown that some types of fruits and vegetables are useful for the prevention of cancer and various chronic diseases. It has been suggested that a diet rich in fruits and vegetables reduces the risk of various cancers, especially cancers of the pancreas, esophagus, colon, stomach, and rectum. These studies were conducted in many countries in Europe and North America, but the number of results is not sufficient for a complete statement of the theory. Eating fruits and vegetables has a protective effect for prevention of epithelial cancer and cancer of the respiratory tract and digestive organs. These studies are insufficient due to the fact that there

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

was not found a hormone that is influenced by fruit and vegetables to prevent the emergence and development of cancer.

Fruits and vegetables as possible approaches to the prevention of cancer, contain a large number of potential anti-cancer elements. It is still unknown exactly what nutritional properties are effective against cancer. They are complementary and overlapping mechanisms of action. At present it is impossible to recommend vitamins against cancer, because the available data on the origin of cancer is not strong or specific enough. While there is no mineral and dietary supplements at the state level of health for the prevention of cancer (Willett 2006; Boyle et al, 2003).

Because of functional proteomics and new DNA chip technology it is possible to understand more details in sphere of cancer disease.

As expected, research on the interaction of nutrients and cancer of the gene led to an understanding of the causes and consequences of cancer. This provided an understanding of the pathophysiological mechanisms and possible prevention of cancer. Through this research it became possible to better monitor the development of cancer, which is crucial to identify risky groups (Go et al, 2001; Willett 2006).

Physical activity, obesity and body composition

If a person regularly engaged in sports, then it reduces the risk of cancer. There are a few evidences that reduced the risk of colon cancer, breast cancer, prostate and uterus (the endometrium). Many believe that this effect is related to the magnitude of body weight and physical activity. Regular exercises, regardless of weight, have a preventive effect for some types of cancer (Boyle et al, 2003; Meltzer, Kaiser and Pichard 2004).

Maintaining a healthy weight is important not only for the prevention of cancer, but also to reduce the risk of other chronic diseases such as diabetes and heart disease (Eyre, Kahn, and Robertson, 2004). cancer risk for obesity and overweight increases. For example, the disease can occur in the colon, in the breast (in postmenopausal women) in the esophagus, gall bladder, the uterus, kidneys and other organs. This is due to the fact that increases the production of estrogen and insulin, which leads to the negative effect caused by being overweight. Cancer cells may start to grow on the basis of these hormones (Ballard-Barbash et al, 2006; Boyle et al, 2003).

Obesity has now become one of the most common problem in the most European countries. There is a growing number of obese people. This issue has become a serious public health implications. In the WHO European Region from 30% to 80% of adults are overweight or obese. According to WHO, 2007, in print, about 20% of children and adolescents are overweight. In addition, one third of the children of the total number of children and adolescents are obese. This figure, as obesity is increasing rapidly. Scientists have suggested that in 2010, 150 million adults and 15 million children will be obese. This problem is most dangerous among children and adolescents. In recent decades overweight and obesity among children is growing steadily and is now 10 times higher than a generation ago, in the 1970s.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

On the basis of statistical data was calculated, what diseases are people suffering from obesity. 39% of the total number of people who are obese, have cancer of the endometrium, 37% of people have cancer adenocarcinoma of the esophagus, 25% of kidney cancer, 24% of gallbladder cancers, 11% of colon cancer and 9% of breast cancer (Boyle et al., 2003). The indicator on the distribution of calories in the body is a reflection of body fat distribution in the body and a penchant for thinness, or fatness. This factor may be more important than total energy consumption, for the risk control of cancer.

Occupational factors

Professional environment as a cause of cancer was reported in 5% of cases. However, it underestimated the importance of exposure to carcinogenic risk factors in the workplace, as most work-related health (Boyle et al, 2003; Siemiatycki et al 2004). It is believed that the central problem of public health should be the issue of cancer research.

The negative impact is usually manifested as malignant tumors. This kind of diseases can be found in the nasopharynx and larynx, bladder, lung, liver, nasal cavity. It may also manifest itself as skin cancer, leukemia, melanoma and mesothelioma. In addition to these there are other examples, but there is no clear justification. In this case, talking about cancer of the stomach, breast, oral cavity, colon and rectum, kidney, esophagus, prostate, pancreas, testes, bone and brain, as well as lymphoma, soft tissue sarcoma and multiple myeloma (Boyle et al., 2003; Siemiatycki et al 2004.).

It was thought that in the EU around 23 % of employed people were exposed to dangerous for health and for life agents at levels above the accessibility. Basically, the impact of these factors is on the bottom level and does not harm human life, although this effect on people is widespread. These include passive smoking, radon, solar radiation, diesel exhaust, benzene, crystalline silica, asbestos, polycyclic aromatic hydrocarbons, wood dust, nickel compounds, formaldehyde, cadmium compounds, chromium (VI) (Boyle et al, 2003; Siemiatycki et al., 2004).

Air pollution and water contaminants

There are several factors that are major characteristics of risk of air pollution: 1,3-butadiene and aldehydes; radon; combustion products such as radionuclides, polycyclic organic matter (POM), organic fibres (mainly asbestos), particulate matter; and residential proximity to industrial point sources (Samet and Cohen 2006).

On the basis of this analysis we can conclude that the effect of carcinogens can be done both indoors and outdoors. This toxicological and epidemiological cause of human cancer.

As the fine particles may be elements that pollute the air. The research results confirm that the spread of contaminants external environment of small particles can cause lung cancer, even at low levels of exposure. Thus, this effect may be subjected to a large number of subjects over long periods of time. According to statisticians, the rate of people with cancer due to this reason, in the EU remains very low, but important (Nawrot et al., 2007).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

There is a theory of the concept as particulate matter (PM). These are particles that can consist of both solid and liquid of the organic or inorganic pollutants in the outside. These particles are in the most common way in the air. During the last decade, researches were carried out in many cities in the WHO European Region. These researches related to short-term exposure of these particles due to the constant and daily changes in concentrations (PM) on human health. Cases of death from lung cancer and cardiovascular diseases, which were the result of negative influence (PM) on human health (Anderson et al, 2004; WHO 2005). One of the main problems is the direction of health policy for additional research on factors affecting the development of lung cancer (Boyle et al, 2003; Samet and Cohen 2006).

To confirm the above, let us turn to the consideration of drinking water. The composition of the water is carcinogenic substances at less than 100 parts per billion [g], which is a proven fact. Let's consider a few contain carcinogenic substances:

- inorganic arsenic (other trace metals are possible) – raises the following types of cancer as cancers of the bladder, non-melanoma skin cancer, kidney cancer and lung cancer;
- organic synthetic chemicals (for example by-products disinfection) – raises the following types of cancer as cancers of the large bowel and the urinary bladder;
- radium – raises the risk of osteosarcoma;
- radon in water – raises the risk of lung cancer in case of extra-level of radon at home;
- nitrate – raises the risk of different type of cancers, especially gastrointestinal cancers.

On the other hand, the presence of magnesium and calcium in the water, as well as the hardness of the water, provides protection against cancer in several places.

Ionizing radiation

There is a complex evidence of the association between high doses of ionizing radiation and cancer in humans (Boice 2006).

The main source of ionizing radiation for people is the natural ground and cosmic radiation level. However, the technical sources, such as nuclear power, nuclear accidents (e.g. Chernobyl), atmospheric nuclear testing and other impacts of comparison, give a much larger public interest. As the result of the atomic bomb survivors of Hiroshima and Nagasaki, the effects of high doses of ionizing radiation was well documented through the studies of that consequences. In medicine for therapeutic reasons (mainly radiotherapy for treating cancer) is used the high dose ionizing radiation.

The United Nations Scientific Committee was established by a UN General Assembly resolution on the Effects of Atomic Radiation (UNSCEAR) in 1955, in reply to broadly concerns of the effects of radiation on human health and the environment. For decades, UNSCEAR has become the world authority on influence of ionizing radiation (UNSCEAR 2007).

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

The population risk of dying from cancer after the impact to an urgent dose of 1000mSv (millisieverts) of ionizing radiation would be around 13% for women and 9% for men, estimated by UNSCEAR.

Exist the evidence that mammography screening programs significantly reduce the mortality of breast cancer. This advantage far outweighs the potential risk of cancer induced by radiation exposure during mammography. However, unnecessary influence of ionizing radiation must be avoided, although the collective exposition of diagnostic tests in comparing with natural radiation is small (Boyce, 2006. Boyle et al, 2003).

Solar radiation

Solar ultraviolet (UV) radiation is part of the electromagnetic spectrum of radiation emerging from the sun (Green and Whiteman 2006). Effect of sunlight is the environmental cause of skin cancer and ultraviolet radiation is a component of the solar spectrum involved. Those affected are mainly fair skin, especially people with red hair or with tendency to burn in the sun (Boyle et al., 2003). Three main types of skin cancer associated with the sun. The most common form of skin cancer among people who work outdoors is the squamous cell carcinoma which displays bright relationship with the cumulative sun influence. The recipients of transplanted organs have a high risk of these tumors by the combined influence of uncontrolled increase HPV in the skin (due to immune deficiency) and the sun.

The most common type of skin cancer is the basal cell carcinoma; but its severity is limited, as this tumor is localized at the surface of the skin. This type of skin cancer, apparently shared etiological relation to being in the sun with melanoma. Finally, skin cancer, it seems, is associated with intermittent sun influence such as sunbathing and outdoor sports. The history of sunburn has repeatedly described as a risk factor. The incidence rates of skin cancer grew faster all over the world than any other malignancy in the Caucasian population in the last 30 years. Mortality continues to grow, despite the improved survival rates during this period (Hyblin and Thomas, 2007).

In Europe, the incidence of melanoma has doubled between 1960 and 1990. This is due to the increase of intensive influence of the sun in the last century. The frequency of squamous cell carcinoma and basal cell cancer is also increased in above mentioned period in all European countries. These tumors are much less life threatening than melanoma, but they account for 95% of all skin cancers. Treatment is a significant financial burdens for people and the health system. Skin cancer remains an important task for cancer prevention and control (Hyblin and Thomas 2007; Green and Whiteman 2006).

Cancer screening and cure cancer

The examination includes testing for disease in people without symptoms, with the main goal of lowering mortality from landing disease, in this case cancer. Further to its influence on life expectancy, screening also has other important implications, including the use of economic resources (as a rule, increase health care costs) and the implications for quality of life, both positive and negative. Cancer is always a potentially fatal disease, because the main purpose of

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

screening and treatment to save lives. Public policy of health associated with cancer screening has always taken, and their score in order to reduce mortality. Thus, the most important indicator of efficiency is mortality.

Screening is suitable when the cancer identify clinical stage during which it can be treated in order to prevent the progression of clear, clinically disease detectable (Cole and Morrison, 1978). Opens clinical stage called the stay time (Day and Walter, 1984). Its length depends on the natural advance of disease, the absorption screening, available to diagnosis and characteristics of the screening test.

The ideal screening program must reduce the burden of disease from the viewpoint mortality and morbidity, and / or improve quality of life. The screen detected breast cancers have a better prognosis than those detected clinically, since disease treated early. However, the selection will always have some side effects. Screen-identified cases often include boundary violations, some of them perform histological criteria for malignancy, but no progress, even if not treated, and will remain clinically slothful (Furihata and Maruchi 1969 Hugosson et al, 2000;. MAIR, 2002; MAIR, 2005). Any screening program reveal such violations as one of the adverse effects of screening are overdiagnosis, that slothful detection of disease, and useless of treatment (excess treatment).

If the disease can be treated successfully after clinical diagnosis it was not necessary for verification. Screening should not be used for incurable diseases.

In screening, primarily involving the goal of early invasive cancer. However, ductal carcinoma also found in 1/5 the frequency of invasive cancer. Mammography includes radiological pictures of the breast (one or two points of view) reading one or two radiologist. Screen-positive conclusion that the defeat is suspicious for breast cancer. Two views, most likely to increase the sensitivity by about 20%, with the largest increase in benefits for the identify of small cancers at women with thick breast tissue. Certain screening programs use two point of view to the first session and only one (mediolateraln oblique) the following screens. Double reading seems increase both the speed challenge and identify of breast cancer by 10%. Diagnostic evaluation demands the original biopsy or removal (open surgical) biopsy.

Screening program conducted by or at the regional or national, including mechanisms for quality assurance for radiology and pathology services. Most application aimed at women in the age group 50-69, with two-year breaks between tests. A few northern European countries have achieved a 80% involvement and revocation rates of 1% to 8%. Prostate cancer has risen sharply over the past 10 to 15 years in the majority industrialized countries. In Europe, there were about 346.000 new cases of prostate cancer in 2004 (20% of all cancers) and nearly 87 000 persons (9% of all cancer deaths) (Ferlay et al., 2007).

Trust defeat for screening is the early invasive of prostate cancer, the diagnosis officially confirmed by prostate biopsy confirmed by prostate biopsy. The natural history of of prostate cancer varies greatly, and some very slothful, slow increasing tumors are others who are very aggressive. Precancerous injury like prostatic intraepithelial neoplasia (PIN), there are, but not

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

much predictive of developing prostate cancer. They are not considered indications for treatment.

Prostate cancer is a hidden common section of finding: it was found in more than 10% of men dying before the age of 50 years, but more often than older men. Overall prostate cancer slothful clear indication of the possibility for overdiagnosis.

The average time a key role in prostate cancer was evaluated in 6 to 12 years. Weather favorable, with a five-year relative survival rate of about 77% in Europe (Berrino et al., 2007). Over the past twenty years a lot of small parts has been accumulated about the main biological processes that are in violation of cancer. They include the key elements of a violation of growth factor mandatory, signal, control of gene transcription, checkpoints of the cell cycle, apoptosis and angiogenesis associated with disorganized growth of cancer cells (Sikora, 2002). They found fertile land for hunting rationally established antitumor preparations and developed a record number of new compounds currently in studies of cancer treatment. The number of such targeted preparations currently licensed for ordinary clinical practice, including rituximab, trastuzumab, imatinib, gefitinib, bevacizumab, lapatinib and cetuximab. Clearly, that will be noticeable the shift in the type of substances used in cancer treatment system over the next decade. It will impose enormous financial burden on all health care system.

9.2 Proposal part – opportunities for cancer prevention

In order to prevent oncological diseases (cancer), one should always consume foods rich in vitamin C (fresh fruit and vegetables), vitamin E (wheat sprouts), beta-carotene (all yellow fruit and vegetables, green leaves of vegetables and edible herbs), B- vitamins (beer yeast, which must be brewed before use) and mictroelements. It is necessary to remember about the importance of fiber (bran, oatmeal, buckwheat, wholemeal rye bread). Dietary supplements provide effective prevention from oncological diseases. Their efficacy has been proven by numerous positive results. Prevention of cancer is a complex of activities undertaken both on national and individual levels.

One of the ways of cancer prevention is the elimination of air pollution by ensuring that industrial and residential smoke emissions remain under control. Switching the later to natural gas, central heating, changes in the regimen of coal burning, installing of modern smoke filters and further technical improvements can help clean the air. It is also of vital importance to construct industrial facilities outside the city limits in order to keep metropolitan air cleaner.

The need for cleaning the air in urban areas from harmful substances is becoming more obvious. The quality of air can be improved by introducing more advanced methods of fuel combustion in a range of industrial enterprises along with automobile and aircraft engines. This should be accomplished by further advancement in engine construction and design, including thorough control of the technical state of the car engines on the road.

In case of cleaning the atmosphere, systematic government activities are required, whereas when it comes to smoking, in addition to prohibition of smoking in public places, the principles

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

of personal hygiene also come into effect. The surest way to prevention of lung cancer is complete abstinence from smoking. Teenage boys usually start smoking at the age of 14 to 17 in order to look more masculine and independent, whereas girls tend to take up smoking a little later on.

The first step towards this harmful habit is usually made in attempt to copy the behaviour of their friends, as a way to manifest their masculinity and independence either before their friends or girlfriends. The role of the family and school in prevention of smoking is unusually high. Personal example may be of great importance: children of smoking parents are very likely to take up the bad habit as well.

If parents are interested in keeping their children away from smoking, they should lead by example and quit smoking, and create a non-smoking home environment. If a young person is brought up in a home with a friendly and healthy environment, is keen on sports, has a broad spectrum of interests and a rich leisure life, this leaves a very little chance for smoking.

Adults who understand the harm of smoking with the help of willpower can overcome this addiction or at least dramatically cut down on the daily number of smoked cigarettes. This will significantly reduce the harmful effect of cancerogenous substances on their organisms and may greatly diminish the risk of lung cancer.

Thus healthy life style, regular physical activities, timely and effective treatment of respiratory tract infections and abstinence from smoking are considered to be reliable measures of prevention of chronic bronchitis and lung cancer.

Unfortunately, all of the above mentioned steps may not fully guarantee that one will not get cancer. On the other hand, certain prevention activities and annual medical check-ups are capable of providing at least minimal prevention.

Conclusion

The objective of this study was to give an image of Kazakhstan in the context of selected European countries in respect to life expectancy, cause-specific mortality and cancer sites in the period between 1986 until 2008.

Cause-specific mortality levels data and population data of Kazakhstan covers the years between 1986-2008. The taken period was observed in the European countries levels in comparison to Kazakhstan, detailed cancer mortality analysis was performed.

These observations argue for making oncological disease control a priority in the healthcare agenda. This will require the development of new managerial systems for cancer control that would facilitate policy and programmatic decisions that take full account for the costeffectiveness and affordability of interventions.

Due to the fact that apart from Kazakhstan I have also analyzed other countries, I think that my thesis may be beneficial not just from Kazakhstan's perspective, but also from the international one. The findings of my thesis may be used in both: medical and social spheres. I have answered all the questions that I raised in the beginning of my thesis. I have found out which types of cancer are the most dangerous ones and also how fast they spread, hence I have pointed out the trends.

I consider all of the objectives of my thesis to have been fulfilled. I have examined cancer mortality rates across Kazakhstan in great detail. I have come to the conclusion that the characteristics of cancer vary significantly in many areas of Kazakhstan. My thesis is intended for a wide range of readers interested in progression of cancer.

Kazakhstan can build on a number of strengths, including the well-established National Institute of Oncology and the population-based Cancer Registry, covering the entire country. Yet, while many cancer control activities have been in place for many years, there is still much room for improvement, and in particular the need to develop a comprehensive national cancer control programme that would incorporate clearly defined goals and objectives, responsibilities, financial support, adequate training and ongoing audit and quality control.

This master thesis has illustrated the many different challenges in terms of health and health threats selected countries of Central and Eastern Europe and the former Soviet Union are currently facing.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

It has shown that several countries especially in Central and Eastern Europe have fared rather successfully and are experiencing sustained improvements in general health indicators such as life expectancy. This review has shown that there is still a substantial unfinished agenda in terms of public health in this region. While much has been achieved in many spheres, there is still some way to go to achieve the levels of health enjoyed in Western Europe. Moreover, new threats, in particular HIV and resistant tuberculosis and the predations of the global tobacco industry, are apparent.

Tackling these problems requires the development of a strong public health capacity in this region that is prepared and equipped to address supranational health threats including trade of products damaging to health if threats to health are to be curtailed. In all of these settings a new generation of strong and effective leaders who can be advocates for healthy public policies is clearly needed.

This calls for particular skills and in some countries the move towards greater democracy and political freedom. However, the often-cited solution, retraining, has been of only moderate success and, regrettably, it has often been necessary to accept that some changes may take a generation to unfold. This means engaging with governments and international agencies in order to change the agenda so that public health is seen as a priority.

Annually, more than 28,000 cases of cancer are identified in the Republic of Kazakhstan. There were about 28,330 new diagnoses of cancer in 2008. Disease incidence is 180.7 per 100,000. Currently, there are approximately 134,000 patients registered in oncology establishments.

In recent years, the north-east regions of the country have been identified as high-incidence areas. Malignancy rates in this area have exceeded the average indicators in the country for many years. The increased cancer rates are connected to adverse events which occurred in the country at the former Semipalatinsk nuclear polygon used as a site for Soviet Union's atomic bomb project. Over 400 atmospheric, above ground and underground nuclear and hydrogen explosions have been conducted here between 1949 to 1989.

There are now special medical programs to help rehabilitate the people who have developed ailments due to the nuclear tests conducted in the area. The northern area and the city of Almaty represent a large megapolis and follow the above-mentioned region using data on the frequency of oncological tumors. The high density of the industrial zones adversely influences the environment which in turn affects factors that promote cancer in these regions.

53.5 % of all cancer cases in the country occur in females. There are more than 50 different kinds of cancer, but some of them—lung, breast, stomach, esophagus, colorectal—represent over half of all new cases.

Annually, more than 4,000 people develop lung cancer in Kazakhstan. Unfortunately, only 20 % of all are diagnosed in the early stages, which accounts for the high mortality rate. The statistical analysis has showed slow growth of survival rates over the last years.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Cigarette smoking has been identified as the most important preventable cause of mortality in the country. Laws on prohibition of smoking in public places were implemented in 2009, which will hopefully result in a decrease of lung cancer cases in future.

Currently, the most important factors affecting health are insufficient physical activity, poor diet, smoking, alcohol consumption, unhealthy lifestyle, intolerance to stress, and, unfortunately, delaying visits to specialists. Worsening environmental conditions in the rapidly developing country continue to impact the health of young generations. The above-mentioned factors affect the cancer incidence in the country and are the main reasons for the expected growth of cancer incidence.

Every year, in the Republic of Kazakhstan there are registered more than 28.000 cases of cancer. In 2008, there were over 28.330 new diagnoses of this disease. Moreover, the disease rate is 180.7 per 100.000. At the moment, there are about 134.000 patients listed in oncology hospitals.

It must be mentioned, that in the last few years, the north-east areas of the country have been determined as high-incidence regions. The medium markers of malignancy in the country have been overpast a lot in comparison with many years. The cancer rates have risen due to facts that took place at the ex-Semipalatinsk nuclear polygon exploited as a location for Soviet Union's atomic bomb plan, in the country. For more than 40 years, 1949 to 1989, there were done over 400 atmospheric, nuclear and hydrogen explosions above ground and underground.

In order to improve the situation and help people, were made special medical programs to help people who developed many diseases and suffer because of the nuclear tests lead in the region. This medical programs help people to rehabilitate. According to the kept data about oncology tumors, Almaty and the norhten area represent a large region where the mentioned disease is very frequent. It is clear that it is caused by the industrial zones which density is very high and it influences negatively the environment. The environment as a result affects factors that provokes cancer in mentioned areas.

It really makes us worry about that fact that 53.5 % of all cancer incidents in the country are found in females. We have to know that, more than 50 different kinds of cancer exist, but the most frequent are: lung, breast, stomach, esophagus, colorectal.

The number of more than 4.000 people that have lung cancer every year in Kazakhstan, is frightening but this is the reality. It is very important the patient to be diagnosed in first stages, but it happens to only 20 % of all, and it accounts for the high mortality rate. Fortunately, not everything is so bad, and the good news is that during the last years the number of survived people grew slowly. It is demonstrated by an statistical analysis.

The worst and the most important thing identified is the cigarette smoking. Therefore, in 2009, there were implemented laws on smoking in public places. We really hope that this will work and the cases of lung cancer will decrease.

Besides smoking, there are also other important agents that affect the health and which must be enumerated: improper diet, stress, alcohol consumption, no physical activity, and of course

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

delaying visits to doctors. An impact is also the fact that the conditions of the environment of the country is worsening day by day, thus influencing the next generations. All pointed factors represent the main causes for an expected growth of cancer incidence in the country, but if they will be worked out the cancer rate can be decreased.

References

Alderson, M. (1981). *International Mortality Statistics*. New York

Anderson, H.R. et al. (2004). *Meta-analysis of time series studies and panel studies of particulate matter (PM) and ozone (O3). Report of a WHO task group*. Copenhagen, WHO.

Asylbekov, M., Kozina (1995). V. Demographical processes in modern Kazakhstan, Atamura: Almaty. (Асылбеков М.Х., Козина В.В. (1995). Демографические процессы современного Казахстана. Атамур: Алматы)

Ballard-Barbash, R. et al. (2006). Obesity and body composition. In: Schottenfeld, D., and Fraumeni, J. (eds.). *Cancer epidemiology and prevention, 3rd edition*. New York, Oxford University Press: 422-448.

Baranova, S. Bad Habits. (2011). *Eliminating dependencies. Psychological practicum*. Audio Course. (Вредные привычки. Избавление от зависимостей. Психологический практикум. Audio course, 2011)

Beaglehole, R. (1992). Cardiovascular disease in developing countries: an epidemic that can be prevented. *BMJ*; 305: 1170–1.

Berrino, F. et al. (2007). Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995–99: results of the EURO CARE–4 study. *Lancet Oncol*, 8(9): 773-783.

Bobak, M., Pikhart, H., Herzman, C., Rose, R., and Marmot, M. (2000). *Socioeconomic factors, material inequalities, and perceived control in self-rated health: Cross-sectional data from seven postcommunist countries*. *Social Science and Medicine*, 51, 1343–1350.

Boice, J.D. (2006). Ionizing radiation. In: Schottenfeld, D., Fraumeni, J. (eds.). *Cancer epidemiology and prevention*. New York, Oxford University Press: 259–293.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Boyle, G., Everett, B., Ramage, J. (2003). *Energy Systems and Sustainability*. Oxford University Press.

Boyle, P. et al. (2003). European Code Against Cancer and scientific justification: third version (2003). *Ann Oncol*, 14(7):973–1005.

Boyle, P. et al. (2004). *Tobacco and public health: science and policy*. Oxford, Oxford University Press

Brainerd, E. and Cutler, D. (2005). *Autopsy on an empire: Understanding mortality in Russia and the Former Soviet Union*. Journal of Economic Perspectives, 19, p.107–130.

Bray, F., Tyczinski J.E., Parkin, D.M. (2004). *Going up or coming down? The changing phases of the lung cancer epidemic from 1967 to 1999 in the 15 European Union countries*. Eur J Cancer.

Brown, M., Lipscomb, J., and Snyder C. (2001). *The burden of illness of cancer: economic cost and quality of life*. Annual Review of Public Health; 22. p. 91-113.

Caldwell, J. (2001). "Population Health Transition". Bulletin of the World Health Organization 79: 159–160.

Cole, P. and Morrison, A.S. (1978). Basic issues in cancer screening. In: Miller AB ed. *Screening in cancer. (UICC Technical Report Series, Vol. 40)*. Geneva, UICC: 7–39.

Cook, P. and Reuter, P. (2007). When is alcohol just another drug? Some thoughts on research and policy. *Addiction*, 102: 1183–1188.

Cook, P. and Reuter, P. (2007). When is alcohol just another drug? Some thoughts on research and policy. *Addiction*, 102: 1183–1188.

Costanza, M.C. et al. (2006). Gender differentials in the evolution of cigarette smoking habits in a general European adult population from 1993–2003. *BMC Public Health*, 6: 130.

Curado, M.P. et al. (2007). *Cancer incidence in five continents*, Vol. IX. (IARC Scientific Publications No. 160). Lyon, IARC.

Dep.iarc.fr, 2010. [online]. *ABOUT CANCER Mondial*. Available at: <http://www-dep.iarc.fr/>, (Accessed 2.03.2012)

Divisi, D. et al. (2006). Diet and cancer. *Acta Biomed*, 77: 118-123.

Divisi, D. et al. (2006). Diet and cancer. *Acta Biomed*, 77: 118-123.

Dunn, J., Palmer, B. (1986). *God Is for the Alcoholic*. Moody Publishers; Revised edition.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Eberstadt, N. (1981). *The health crisis in the USSR*. The New York Review of Book, 28(2).

Epp.eurostat.ec.europa.eu, 2012. [online] *Latest updates of Statistics Explained*. Available at: <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>, (Accessed 2.03.2012)

Euro.who.int, 2012. *What we do*. [online]. Available at: <http://www.euro.who.int/en/home>, (Accessed 2.03.2012)

Ferlay, J. (2007). Estimates of the cancer incidence and mortality in Europe in 2006, *Ann Oncol*, 18(3): 581-592.

Furihata, R. and Maruchi, N. (1969). Epidemiological studies on thyroid cancer in Nagano prefecture, Japan. In: Hedinger CE ed. *Thyroid cancer. (UICC Monograph Series, Vol. 12)*. Berlin, Springer-Verlag: 79.

Gks.ru, 2012. [online] *Информационные материалы об окончательных итогах Всероссийской переписи населения 2010 года*. Available at: <http://www.gks.ru/wps/wcm/connect/rosstat/rosstatsite/main/>, (Accessed 2.03.2012)

Global Health risks. *World Health Organization*. Euro.who.int, 2012. [online] *WHO/Europe home page*. Available at: <http://www.euro.who.int/en/home>, (Accessed 2.03.2012)

Go, V.L., Wong, D.A., and Butrum, R. (2001). Diet, nutrition and cancer prevention: where are we going from here? *J Nutr*, 131(Suppl. 11): 3121S-3126S.

Green, A.C. and Whiteman, D.C. (2006). Solar radiation. In: Schottenfeld, D. and Fraumeni, J. (eds.). *Cancer epidemiology and prevention*. New York, Oxford University Press: 294-305.

Hecht, S.S. (2005). Carcinogenicity studies of inhaled cigarette smoke in laboratory animals: old and new. *Carcinogenesis*, 26(9): 1488-1492.

IARC, (1986). IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, Vol. 41, Some Halogenated and Pesticide Exposures, Lyon.

IARC, (2004). IARC Scientific Publications, n.157. Lyon: IARCPress.

Kozina, V. (2000) Inhabitants of the Central kazakhstan. Almaty : Orkeniet. (Козина В. В. Население Центрального Казахстана, Книга первая. Алматы, Оркениет, 2000, 144 страницы)

Lecba-rakoviny.cz, 2012. [online] *Co je rakovina*. Available at: <http://www.lecba-rakoviny.cz/jak-vznika-rakovina>, (Accessed 2.03.2012)

Lecba-rakoviny.cz, 2012. [online] *Jak vzniká rakovina*. Available at: <http://www.lecba-rakoviny.cz/jak-vznika-rakovina>, (Accessed 2.03.2012)

- Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008
- Mackenbach, J. (1993). *De epidemiologische transitie in Nederland*. *Ned Tijdschr Geneesk*; 137: 132-8.
- Martin-Moreno, J.M. (2000). The role of olive oil in lowering cancer risk: is this real gold or simply pinchbeck? *J Epidemiol Community Health*, 54: 726–727.
- McKee, M. and Britton, A. (1998). *The positive relationship between alcohol and heart disease in Eastern Europe: Potential physiological mechanisms*. *Journal of the Royal Society of Medicine*, 91, p. 402-407.
- Melzer, K., Kayser, B., and Pichard, C. (2004). Physical activity: the health benefits outweigh the risks. *Curr Opin Clin Nutr Metab Care*, 7(6): 641–647.
- Mesle, F. and Vallin, J. (2000). *Transition sanitaire: Tendances et perspectives*. *Medecine/science* 16: 1, p.161–1,171.
- Mesle, F., Vallin, J., Hertrich, V., Andreev, E., and Shkolnikov, V. (2003). *Causes of death in Russia: Assessing trends since the 1950s*. In Kotowska I., and Jozwiak J. (eds.). *Population of Central and Eastern Europe. Challenges and opportunities* (pp. 389–414). Warsaw: Statistical Publishing Establishment.
- Nawrot, T.S. et al. (2007). Lung cancer mortality and fine particulate air pollution in Europe. *Int J Cancer*, 120(8): 1825-1826; authors' reply: 1827.
- Nawrot, T.S. et al. (2007). Lung cancer mortality and fine particulate air pollution in Europe. *Int J Cancer*, 120(8): 1825-1826; authors' reply: 1827.
- Olshansky, S.J. and Ault, B. (1986). "The Fourth Stage of the Epidemiologic Transition: The Age of Delayed Degenerative Diseases." *Milbank Quarterly* 64: 355–391.
- Omran, A. (1971). *The epidemiologic transition: A theory of the epidemiology of population change*. *Milbank Memorial Fund Quarterly*, 49, p. 509–538.
- Parkin, D.M. (2001). Global cancer statistics in the year 2000. *the Lancet Oncology* 2: 533–543.
- Petridou, E.T. et al. (2007). *Unintentional injury mortality in the European Union: how many more lives could be saved?* *Scand J Public Health*, 35: 278-287.
- Petridou, E.T. et al. (2007). Unintentional injury mortality in the European Union: how many more lives could be saved? *Scand J Public Health*, 35: 278-287.
- Pisinger, C. and Godtfredsen, N.S. (2007). Is there a health benefit of reduced tobacco consumption? A systematic review. *Nicotine Tob Res*, 9: 631-646.
- Pisinger, C., Godtfredsen, NS. (2007). *Is there a health benefit of reduced tobacco consumption? A systematic review*. *Nicotine Tob Res*.

- Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008
- Pöschl G, Seitz HK. (2004). *Alcohol and cancer*. Department of Medicine, Salem Medical Centre, Heidelberg, Germany.
- Pöschl, G. and Seitz, H.K. (2004). Alcohol and cancer. *Alcohol and Alcoholism*, 39: 155–165.
- Praha-tip.cz, 201. [online]. Available at: www.prahatip.cz. Accessed 4.3.2012
- Robine, J. (2001). “*Redefining the Stages of the Epidemiological Transition by a Study of the Dispersion of Life Spans: The Case of France.*” *Population: An English Selection* 13(1): 173–194.
- Samet, J.M. and Cohen, A.J. (2006). Air pollution. In: Schottenfeld, D. and Fraumeni, J. (eds.). *Cancer epidemiology and prevention, 3rd edition*. New York, Oxford University Press: 355–381.
- Shkolnikov, V. and Nemtsov, A. (1997). The anti-alcohol campaign and variations in Russian mortality. In Bobadilla, J., Costello, C. and Mitchell F. (eds.). *Premature death in the New Independent States* (pp. 239–261). Washington, DC: National Academy Press.
- Shkolnikov, V., Cornia, G., Leon, D., and Mesle', F. (1998). Causes of the Russian mortality crisis: Evidence and interpretations. *World Development*, 26(11), 1995–2011.
- Shkolnikov, V., Mesle', F., and Vallin, J. (1996). Health crisis in Russia I. Recent trends in life expectancy and causes of death. *Population: An English Selection*, vol. 8. pp. 123–154.
- Siemiatycki, J. et al. (2004). Listing occupational carcinogens. *Environ Health Perspect*, 112: 1447–1459.
- Sikora, K. (2002). The impact of future technology on cancer care. *Clin Med*, 2: 560–568.
- Sikora, K. (2004). Cancer 2025: the future of cancer care. *Expert Review of Anticancer Therapy Supplement*, 4(3s1): 1–78.
- Simonato, A., Gregori, A., Lissiani, A., Bozzola, A., Galli, S., Gaboardi, F. (2004). *Intracorporeal uretero-enteric anastomoses during laparoscopic continent urinary diversion*. BJU International
- Stat.kz, 2008. *Основные социально-экономические показатели*. Available at: <http://www.stat.kz/Pages/default.aspx>, (Accessed 2.03.2012)
- Stats.oecd.org, (2011). [online] POTENTIAL YEARS OF LIFE LOST. Available at: <http://stats.oecd.org/glossary/detail.asp?ID=2095>, (Accessed 2.03.2012)
- Susanna B. Hecht. (2005). *Development and Conservation on the Amazon Frontier*. Development and Change.

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

UNSCEAR (2007). *Mandate of the Committee: UNSCEAR Secretariat - United Nations*. Vienna, The United Nations Scientific Committee on the Effects of Atomic Radiation.

Vemuri, A.W., & Costanza, R., (2006). *The role of human, social, built, and natural capital in explaining life satisfaction at the country level: toward a National Well-Being Index (NWI)*. Ecological Economics, 58:119-133.

Webster N. (1913). *Webster's Revised Unabridged Dictionary*. G & C. Merriam Co.

Willett, W.C. (2006). Diet and nutrition. In: Schottenfeld D, Fraumeni J. (eds.). *Cancer epidemiology and prevention, 3rd edition*. New York, Oxford University Press: 405–421.

Willett, W.C. (2006). Diet and nutrition. In: Schottenfeld D, Fraumeni J. (eds.). *Cancer epidemiology and prevention, 3rd edition*. New York, Oxford University Press: 405–421.

Zdravaprsa.cz (2012). [online] Available at: www.zdravaprsa.cz. (Accessed 4.3.2012)

List of appendices

Appendix 1: Life expectancy in selected European countries, Kazakhstan and the Russian Federation, selected years

Appendix 2: Mortality caused by all causes in selected years, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 3: Mortality caused by infectious diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 4: Mortality caused by neoplasm diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 5: Mortality caused by circulatory diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 6: Mortality caused by respiratory diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 7: Mortality caused by digestive diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 8: Mortality caused by external diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 9: Mortality caused by others diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Appendix 10: The structure of cancer mortality by the leading sites of neoplasm, the Czech Republic, selected years, males

Appendix 11: The structure of cancer mortality by the leading sites of neoplasm, the Czech Republic, selected years, females

Appendix 12: The structure of cancer mortality by the leading sites of neoplasm, France, selected years, males

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 13: The structure of cancer mortality by the leading sites of neoplasm, France, selected years, females

Appendix 14: The structure of cancer mortality by the leading sites of neoplasm, Hungary, selected years, males

Appendix 15: The structure of cancer mortality by the leading sites of neoplasm, Hungary, selected years, females

Appendix 16: The structure of cancer mortality by the leading sites of neoplasm, Italy, selected years, males

Appendix 17: The structure of cancer mortality by the leading sites of neoplasm, Italy, selected years, females

Appendix 18: The structure of cancer mortality by the leading sites of neoplasm, Kazakhstan, selected years, males

Appendix 19: The structure of cancer mortality by the leading sites of neoplasm, Kazakhstan, selected years, females

Appendix 20: The structure of cancer mortality by the leading sites of neoplasm, Norway, selected years, males

Appendix 21: The structure of cancer mortality by the leading sites of neoplasm, Norway, selected years, females

Appendix 22: The structure of cancer mortality by the leading sites of neoplasm, the Russian Federation, selected years, males

Appendix 23: The structure of cancer mortality by the leading sites of neoplasm, the Russian Federation, selected years, females

Appendix 24: The structure of cancer mortality by the leading sites of neoplasm, Sweden, selected years, males

Appendix 25: The structure of cancer mortality by the leading sites of neoplasm, Sweden, selected years, females

Appendix 26: The potential years of life lost (YPLL) for selected countries, males, females, 2006

Appendix 27: Aging index of all countries, selected years of the period 1986-2006, males

Appendix 28: Aging index of all countries, selected years of the period 1986-2006, females

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 1: Life expectancy in selected European countries, Kazakhstan and the Russian Federation, selected years

Czech Republic	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	67,5	67,6	70,4	71,7	73,4	6,0	5,9	3,1	1,8
		Females	74,7	75,5	77,4	78,5	79,9	5,2	4,4	2,4	1,4
		Differences	7,2	7,9	7,1	6,8	6,4				
	Life expectancy at age 65	Males	11,5	11,7	13,1	13,8	14,8	3,3	3,2	1,7	1,1
		Females	14,8	15,3	16,6	17,3	18,3	3,5	2,9	1,7	1,0
		Differences	3,3	3,7	3,4	3,5	3,4				
France	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	71,7	73,3	74,7	75,4	77,4	5,6	4,0	2,6	2,0
		Females	79,9	81,7	82,7	83,0	84,4	4,5	2,7	1,7	1,4
		Differences	8,2	8,4	8,0	7,6	7,0				
	Life expectancy at age 65	Males	14,6	16,0	16,6	16,8	18,2	3,6	2,2	1,6	1,4
		Females	19,1	20,6	21,3	21,4	22,6	3,5	2,0	1,3	1,2
		Differences	4,5	4,6	4,7	4,6	4,4				

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 1: continued

Hungary	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	65,3	65,1	66,3	67,1	69,2	3,9	4,0	2,9	2,0
		Females	73,3	73,8	75,0	75,7	77,7	4,4	3,9	2,7	2,0
		Differences	8,0	8,6	8,7	8,6	8,5				
	Life expectancy at age 65	Males	11,9	12,1	12,3	12,6	13,6	1,7	1,6	1,3	1,1
		Females	15,0	15,4	15,9	16,4	17,7	2,6	2,3	1,7	1,3
		Differences	3,1	3,3	3,6	3,8	4,0				
Italy	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	72,6	73,7	75,2	76,5	78,5	5,8	4,8	3,3	2,0
		Females	79,2	80,4	81,5	82,5	84,2	5,0	3,8	2,6	1,6
		Differences	6,5	6,7	6,4	6,0	5,7				
	Life expectancy at age 65	Males	14,3	15,0	15,9	16,5	17,9	3,6	2,8	1,9	1,3
		Females	18,1	19,0	20,0	20,5	21,8	3,7	2,8	1,8	1,3
		Differences	3,8	3,9	4,1	4,0	3,9				
Kazakhstan	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	64,2	63,8	58,8	60,0	60,6	-3,6	-3,2	1,8	0,5
		Females	73,0	73,3	70,2	71,5	71,9	-1,1	-1,4	1,7	0,4
		Differences	8,9	9,5	11,4	11,5	11,4				
	Life expectancy at age 65	Males	12,6	12,5	10,7	10,5	11,3	-1,3	-1,2	0,6	0,8
		Females	16,6	16,4	14,6	15,1	15,0	-1,5	-1,3	0,4	-0,1
		Differences	3,9	3,9	3,9	4,6	3,7				

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Norway	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	72,8	73,4	75,4	75,9	78,2	5,4	4,8	2,8	2,3
		Females	79,9	79,9	81,1	81,4	82,8	2,9	2,9	1,7	1,4
		Differences	7,0	6,5	5,8	5,5	4,6				
	Life expectancy at age 65	Males	14,5	14,6	15,5	16,1	17,6	3,1	3,0	2,1	1,5
		Females	18,9	18,7	19,6	19,8	20,8	1,9	2,1	1,2	1,0
		Differences	4,4	4,1	4,1	3,7	3,2				
Russian Federation	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	64,8	63,7	59,6	59,0	60,3	-4,5	-3,4	0,7	1,3
		Females	74,3	74,3	72,4	72,3	73,2	-1,1	-1,2	0,7	0,9
		Differences	9,5	10,6	12,8	13,2	12,8				
	Life expectancy at age 65	Males	12,1	12,0	11,3	11,1	11,4	-0,6	-0,6	0,1	0,4
		Females	15,8	15,8	15,2	15,1	15,6	-0,2	-0,2	0,4	0,5
		Differences	3,7	3,8	3,9	4,1	4,2				
Sweden	Indicator	Sex	1986	1990	1996	2000	2006	2006-1986	2006-1990	2006-1996	2006-2000
	Life expectancy at birth	Males	74,0	74,8	76,6	77,4	78,7	4,7	3,9	2,1	1,4
		Females	80,1	80,5	81,7	82,1	83,0	2,8	2,5	1,3	0,9
		Differences	6,2	5,7	5,1	4,7	4,3				
	Life expectancy at age 65	Males	14,8	15,3	16,1	16,7	17,7	2,8	2,3	1,5	1,0
		Females	18,9	19,2	19,9	20,2	20,8	1,9	1,6	0,9	0,6
		Differences	4,0	3,8	3,7	3,5	3,1				

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 2: Mortality caused by all causes in selected years, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	All causes			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	1590.6	1268.8	1024.1	80	64	81
France	1102.3	864.6	715.2	78	65	83
Hungary	1653.5	1581.3	1316.6	96	80	83
Italy	1066.0	860.8	668.9	81	63	78
Kazakhstan	1550.5	2159.2	1971.1	139	127	91
Norway	1036.8	880.5	686.1	85	66	78
Russian Federation	1622.1	2028.9	1997.3	125	123	98
Sweden	973.0	806.4	666.9	83	69	83

Countries	Females					
	All causes			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	953.9	750.1	613.2	79	64	82
France	579.2	452.4	394.6	78	68	87
Hungary	985.8	880.8	714.7	89	73	81
Italy	629.1	505.9	401.9	80	64	79
Kazakhstan	887.8	1122.3	1055.6	126	119	94
Norway	587.8	534.7	459.2	91	78	86
Russian Federation	895.2	1009.5	976.8	113	109	97
Sweden	579.5	509.0	451.9	88	78	89

Source: Author's own calculations based on data from WHO mortality database

Appendix 3: Mortality caused by infectious diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Infectious diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	5.8	3.4	4.3	59	74	126
France	13.3	11.1	13.6	83	103	123
Hungary	14.2	11.3	5.5	80	39	49
Italy	5.5	4.6	10.1	84	185	221
Kazakhstan	44.4	91.8	44.0	207	99	48
Norway	6.3	9.2	11.3	146	180	124
Russian Federation	24.7	40.0	40.9	162	166	102
Sweden	6.0	6.1	9.4	102	156	153

Countries	Females					
	Infectious diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	3.8	1.5	2.7	39	70	181
France	8.0	6.5	7.6	81	94	117
Hungary	5.1	3.5	2.0	69	40	58
Italy	3.0	2.8	5.6	92	186	203
Kazakhstan	19.8	21.6	13.0	109	66	60
Norway	4.3	5.0	7.7	116	177	153
Russian Federation	7.7	7.5	9.7	98	126	129
Sweden	5.1	4.4	6.7	86	132	152

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 4: Mortality caused by neoplasm diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Neoplasm diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	353.4	338.6	286.8	96	81	85
France	322.1	286.1	251.1	89	78	88
Hungary	349.5	394.3	348.4	113	100	88
Italy	289.5	273.0	233.2	94	81	85
Kazakhstan	310.7	292.6	229.5	94	74	78
Norway	230.6	233.4	200.7	101	87	86
Russian Federation	306.6	299.7	267.9	98	87	89
Sweden	201.5	195.1	183.5	97	91	94

Countries	Females					
	Neoplasm diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	190.9	179.8	164.9	94	86	92
France	140.7	129.6	125.2	92	89	97
Hungary	192.5	203.2	178.8	106	93	88
Italy	148.9	143.6	128.0	96	86	89
Kazakhstan	154.4	147.0	128.5	95	83	87
Norway	153.2	162.4	141.1	106	92	87
Russian Federation	139.4	139.7	132.6	100	95	95
Sweden	147.3	144.8	139.2	98	94	96

Source: Author's own calculations based on data from WHO mortality database

Appendix 5: Mortality caused by circulatory diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Circulatory diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	848.5	666.3	477.8	79	56	72
France	348.6	239.0	174.3	69	50	73
Hungary	820.2	738.4	590.7	90	72	80
Italy	439.8	328.1	225.4	75	51	69
Kazakhstan	727.5	1064.6	1068.8	146	147	100
Norway	498.2	374.5	221.8	75	45	59
Russian Federation	877.1	987.0	1044.5	113	119	106
Sweden	510.8	377.1	261.9	74	51	69

Countries	Females					
	Circulatory diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	549.2	430.6	318.2	78	58	74
France	205.4	138.1	102.1	67	50	74
Hungary	549.2	477.0	366.4	87	67	77
Italy	294.4	215.7	151.0	73	51	70
Kazakhstan	496.1	658.8	658.9	133	133	100
Norway	258.5	208.5	144.3	81	56	69
Russian Federation	588.6	606.4	606.4	103	103	100
Sweden	287.7	217.4	162.9	76	57	75

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 6: Mortality caused by respiratory diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Respiratory diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	103.5	56.5	60.1	55	58	106
France	79.1	65.3	39.3	83	50	60
Hungary	103.8	78.2	70.1	75	68	90
Italy	89.8	57.8	45.1	64	50	78
Kazakhstan	185.5	213.0	124.5	115	67	58
Norway	80.4	71.5	62.6	89	78	88
Russian Federation	123.1	129.3	101.2	105	82	78
Sweden	76.4	63.9	38.4	84	50	60
Countries	Females					
	Respiratory diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	48.4	29.1	30.2	60	62	104
France	35.0	29.9	18.2	86	52	61
Hungary	41.7	32.7	29.0	78	69	89
Italy	35.4	21.3	18.5	60	52	87
Kazakhstan	85.5	80.6	40.9	94	48	51
Norway	50.0	44.6	39.8	89	80	89
Russian Federation	44.1	34.3	24.4	78	55	71
Sweden	41.5	37.2	25.3	90	61	68

Source: Author's own calculations based on data from WHO mortality database

Appendix 7: Mortality caused by digestive diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Digestive diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	63.4	49.5	48.5	78	77	98
France	66.3	45.0	31.9	68	48	71
Hungary	101.4	134.2	106.0	132	105	79
Italy	67.6	42.3	27.4	63	41	65
Kazakhstan	57.6	75.8	91.4	132	159	121
Norway	29.1	24.5	17.5	84	60	71
Russian Federation	44.1	62.8	81.9	142	186	130
Sweden	26.8	25.9	21.7	97	81	84
Countries	Females					
	Digestive diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	30.1	23.8	25.2	79	84	106
France	32.5	23.7	16.2	73	50	68
Hungary	48.0	51.2	42.8	107	89	83
Italy	31.0	23.9	15.9	77	51	66
Kazakhstan	31.8	36.8	43.3	116	136	118
Norway	18.1	14.0	13.4	78	74	96
Russian Federation	20.9	27.7	40.9	133	196	148
Sweden	14.8	16.0	13.6	108	92	85

Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 8: Mortality caused by external diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	External diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	109.7	99.5	78.1	91	71	78
France	112.7	86.5	66.6	77	59	77
Hungary	167.5	141.5	103.5	84	62	73
Italy	63.9	54.4	43.1	85	68	79
Kazakhstan	98.0	275.6	263.4	281	269	96
Norway	79.2	57.5	57.2	73	72	99
Russian Federation	174.4	354.0	317.5	203	182	90
Sweden	75.3	54.6	53.4	73	71	98
Countries	Females					
	External diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	58.9	42.4	25.5	72	43	60
France	50.8	37.5	27.7	74	55	74
Hungary	73.1	54.5	31.7	75	43	58
Italy	27.5	23.4	16.0	85	58	69
Kazakhstan	33.1	72.8	66.8	220	202	92
Norway	33.5	26.3	25.4	78	76	97
Russian Federation	48.1	84.3	75.4	175	157	89
Sweden	30.1	23.8	22.8	79	76	96

Source: Author's own calculations based on data from WHO mortality database

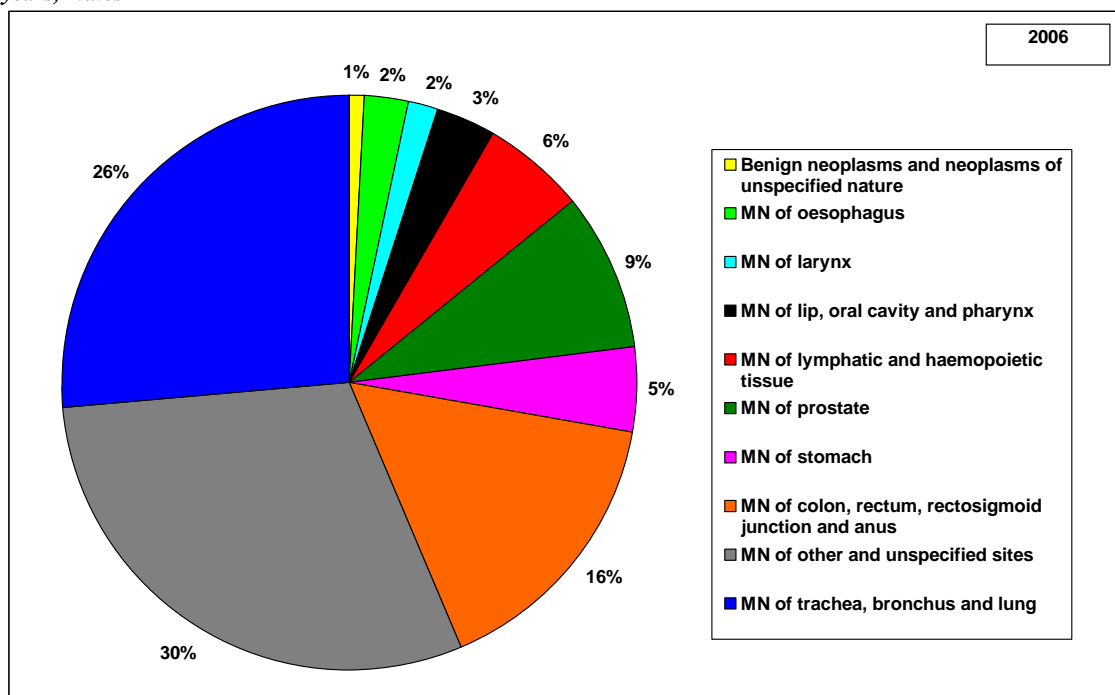
Appendix 9: Mortality caused by others diseases in selected years, males, females, standardized death rates (per 100 000 persons, WHO European Population Standard)

Countries	Males					
	Others diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	106.3	54.9	68.6	52	65	125
France	160.2	131.6	138.3	82	86	105
Hungary	96.9	83.5	92.4	86	95	111
Italy	109.9	100.6	84.4	92	77	84
Kazakhstan	126.8	145.9	149.4	115	118	102
Norway	113.0	110.0	115.0	97	102	105
Russian Federation	72.1	156.1	143.5	217	199	92
Sweden	76.1	83.7	98.5	110	129	118
Countries	Females					
	Others diseases			Index (%)		
	1986	1996	2006	1996/1986	2006/1986	2006/1996
Czech Republic	72.7	42.9	46.6	59	64	109
France	106.8	87.2	97.6	82	91	112
Hungary	76.3	58.7	64.0	77	84	109
Italy	88.9	75.2	66.9	85	75	89
Kazakhstan	67.0	104.6	104.2	156	155	100
Norway	70.2	74.0	87.5	105	125	118
Russian Federation	46.4	109.5	87.3	236	188	80
Sweden	52.9	65.5	81.4	124	154	124

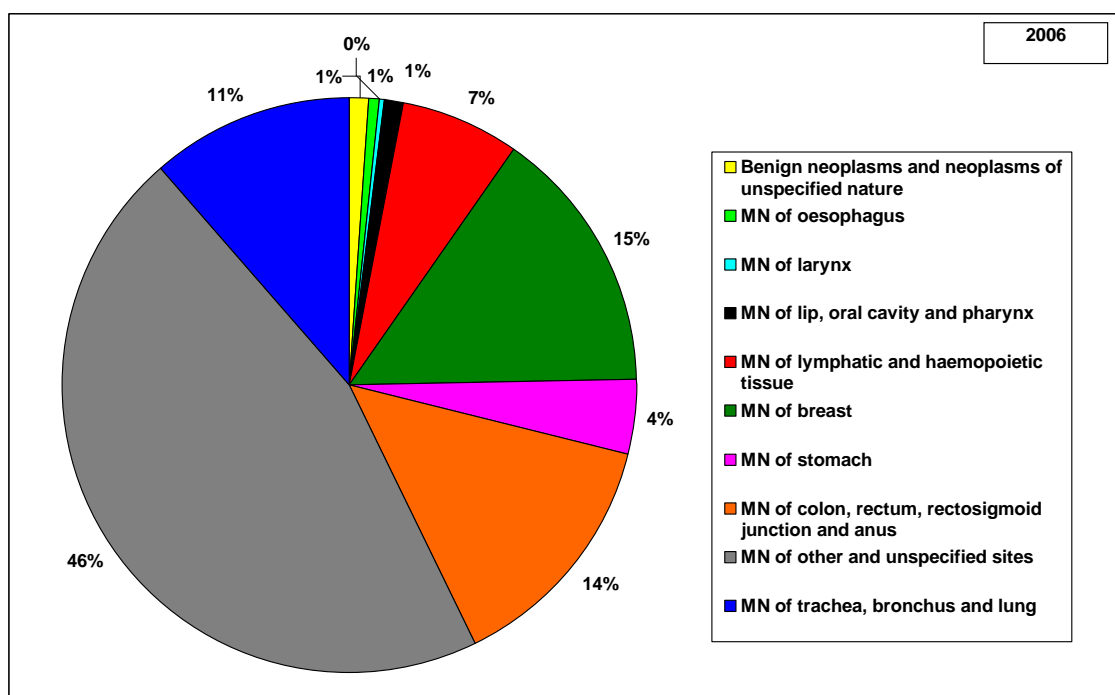
Source: Author's own calculations based on data from WHO mortality database

Askhat Ashimov: Trends and patterns of cancer mortality in Kazakhstan in comparison with some selected European countries from 1986 to 2008

Appendix 10: The structure of cancer mortality by the leading sites of neoplasm, the Czech Republic, selected years, males

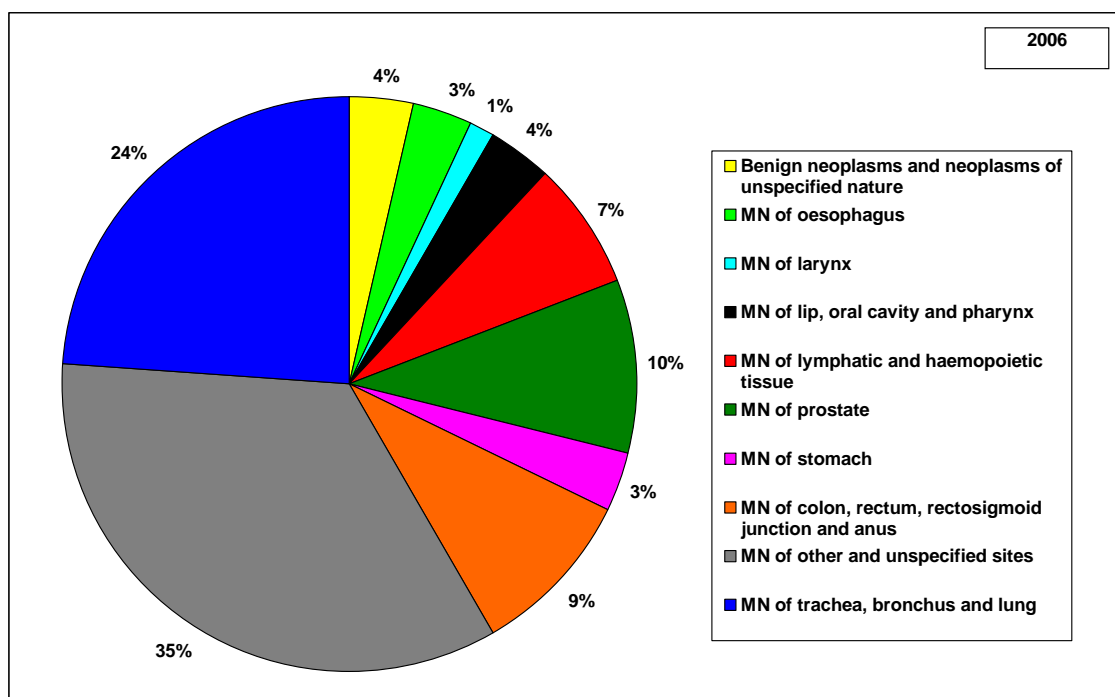


Appendix 11: The structure of cancer mortality by the leading sites of neoplasm, the Czech Republic, selected years, females

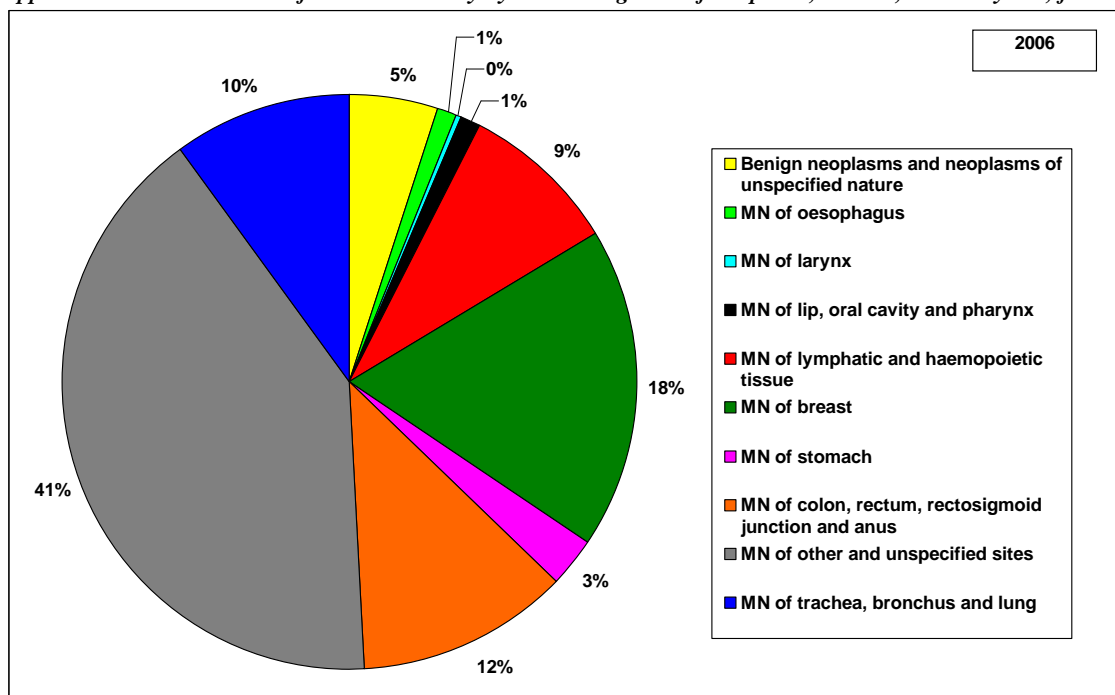


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Appendix 12: The structure of cancer mortality by the leading sites of neoplasm, France, selected years, males

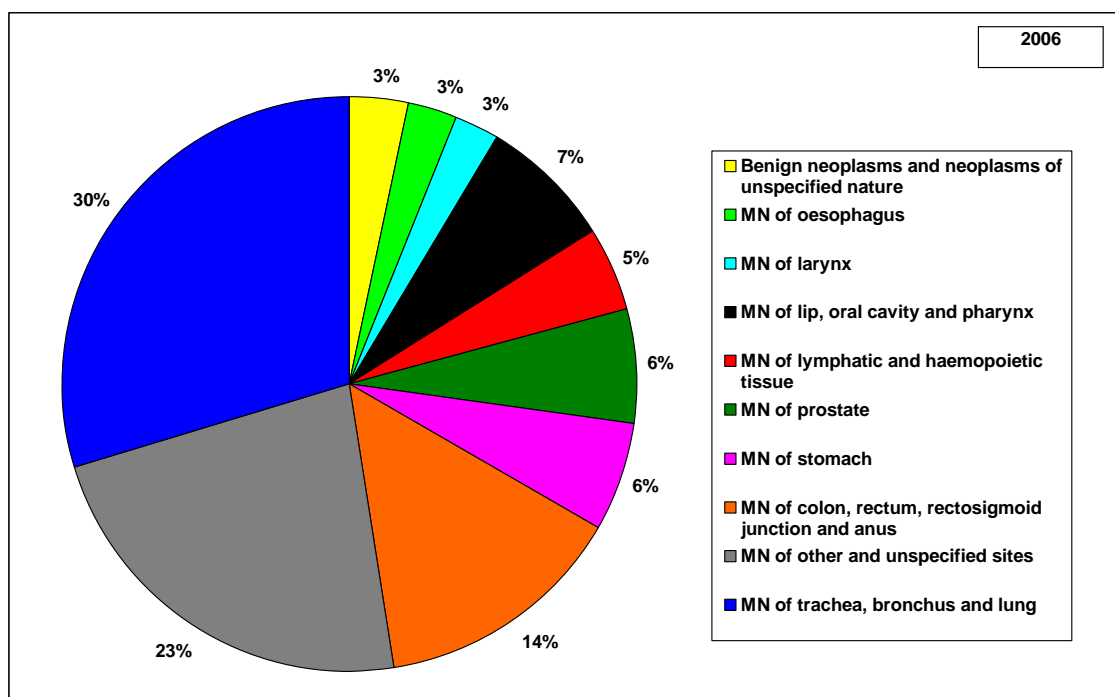


Appendix 13: The structure of cancer mortality by the leading sites of neoplasm, France, selected years, females

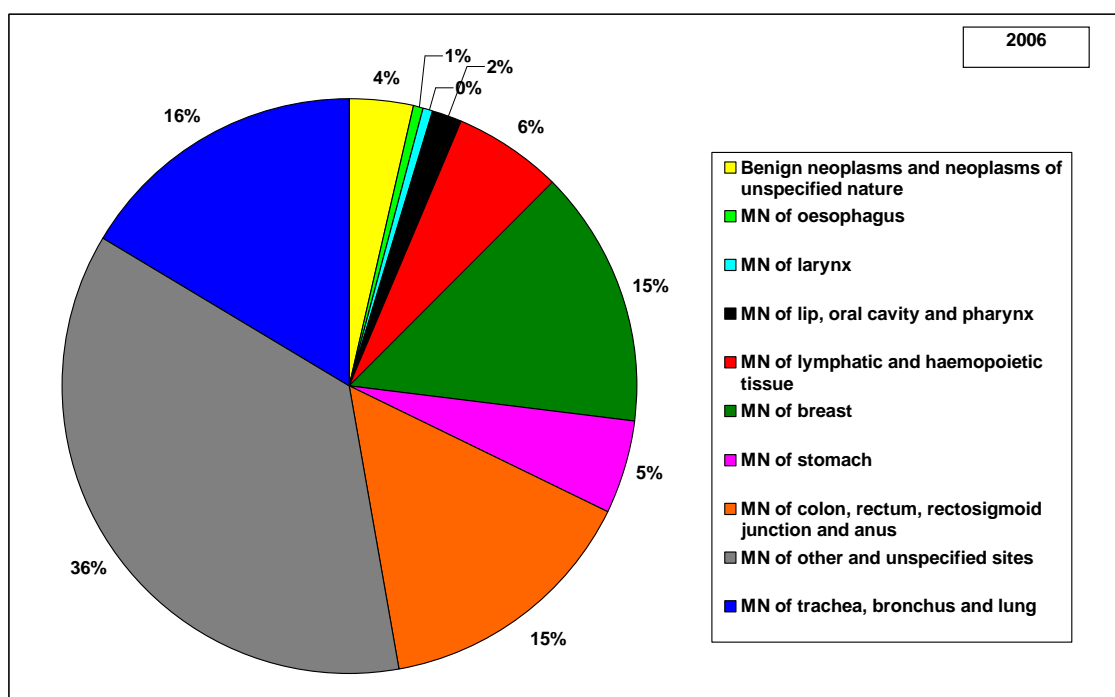


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Appendix 14: The structure of cancer mortality by the leading sites of neoplasm, Hungary, selected years, males

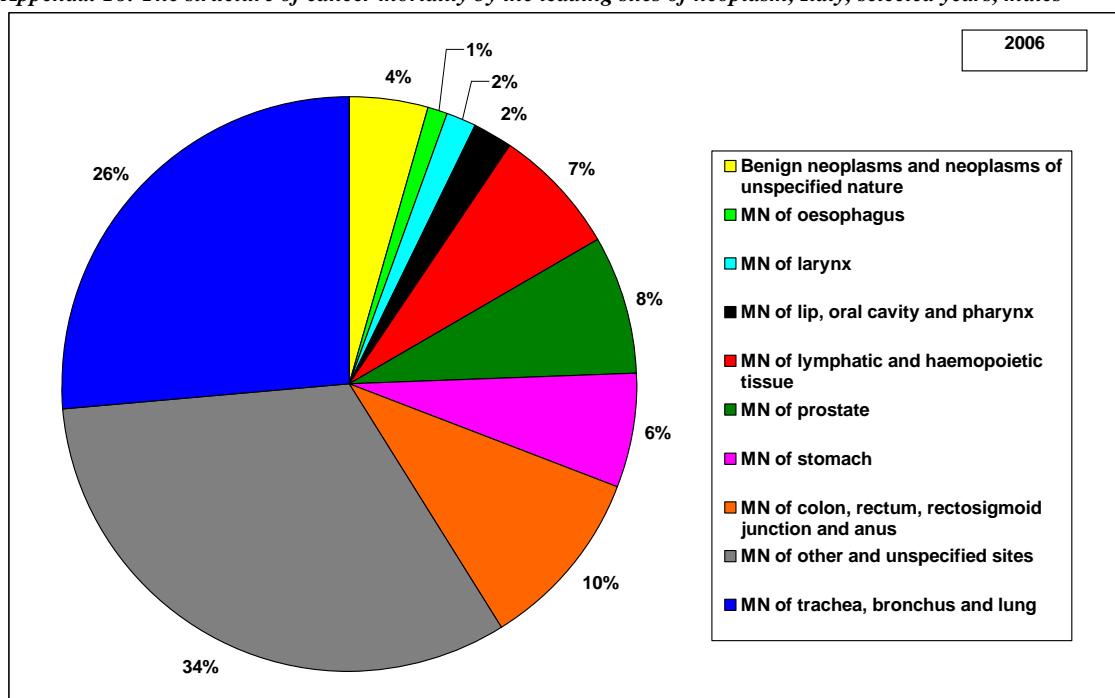


Appendix 15: The structure of cancer mortality by the leading sites of neoplasm, Hungary, selected years, females

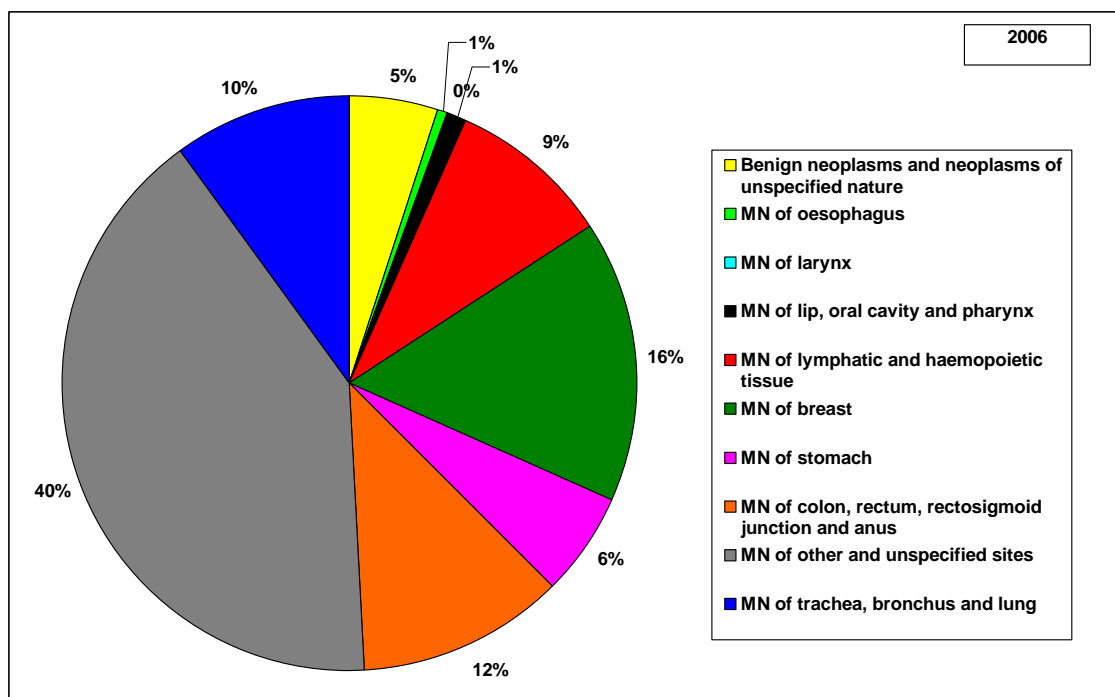


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Appendix 16: The structure of cancer mortality by the leading sites of neoplasm, Italy, selected years, males

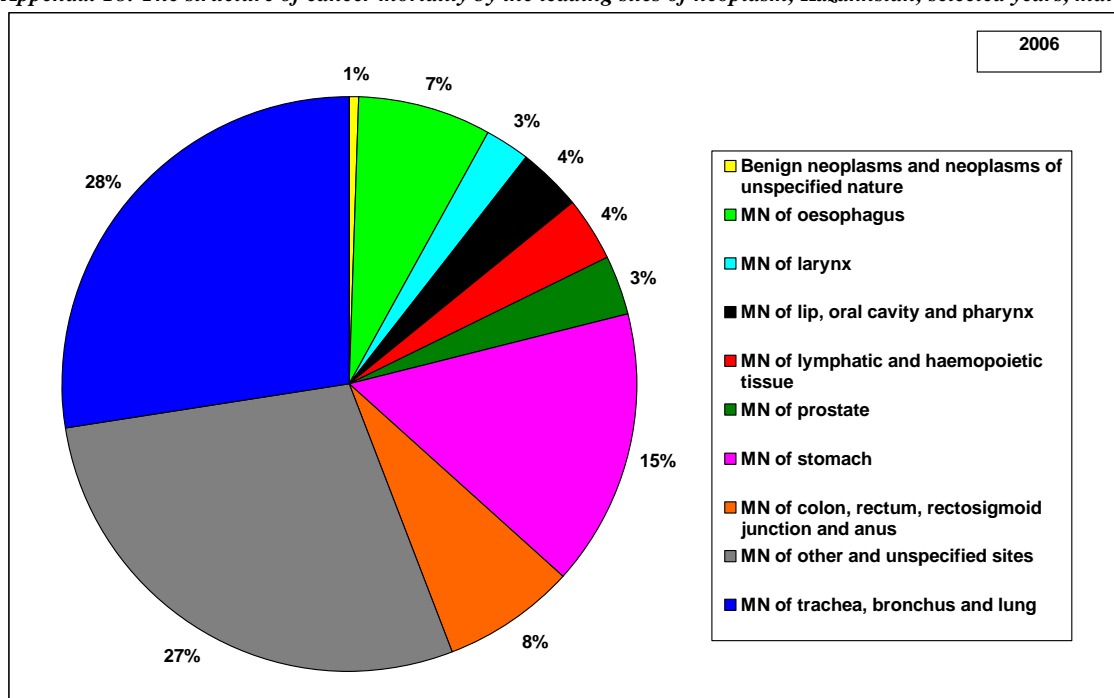


Appendix 17: The structure of cancer mortality by the leading sites of neoplasm, Italy, selected years, females

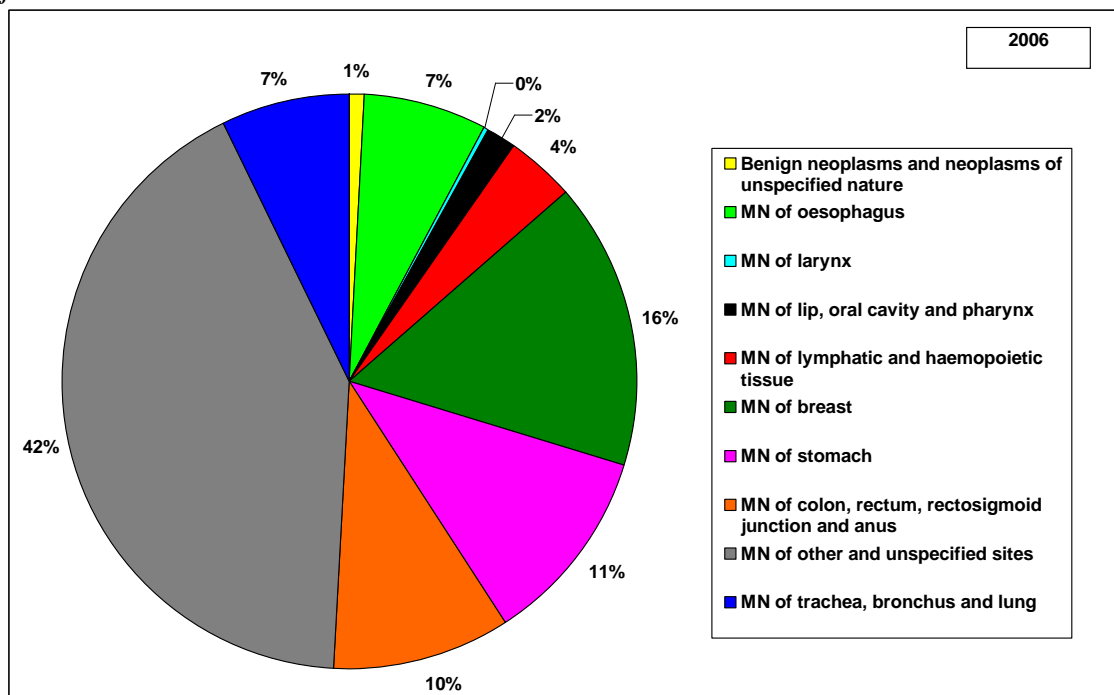


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Appendix 18: The structure of cancer mortality by the leading sites of neoplasm, Kazakhstan, selected years, males

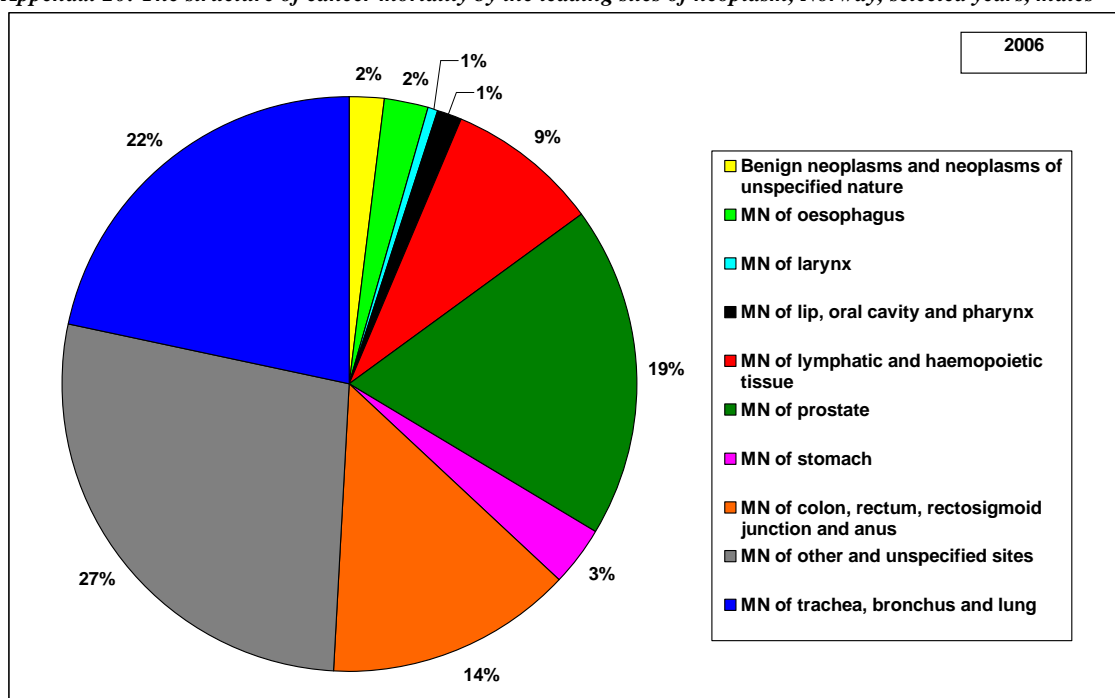


Appendix 19: The structure of cancer mortality by the leading sites of neoplasm, Kazakhstan, selected years, females

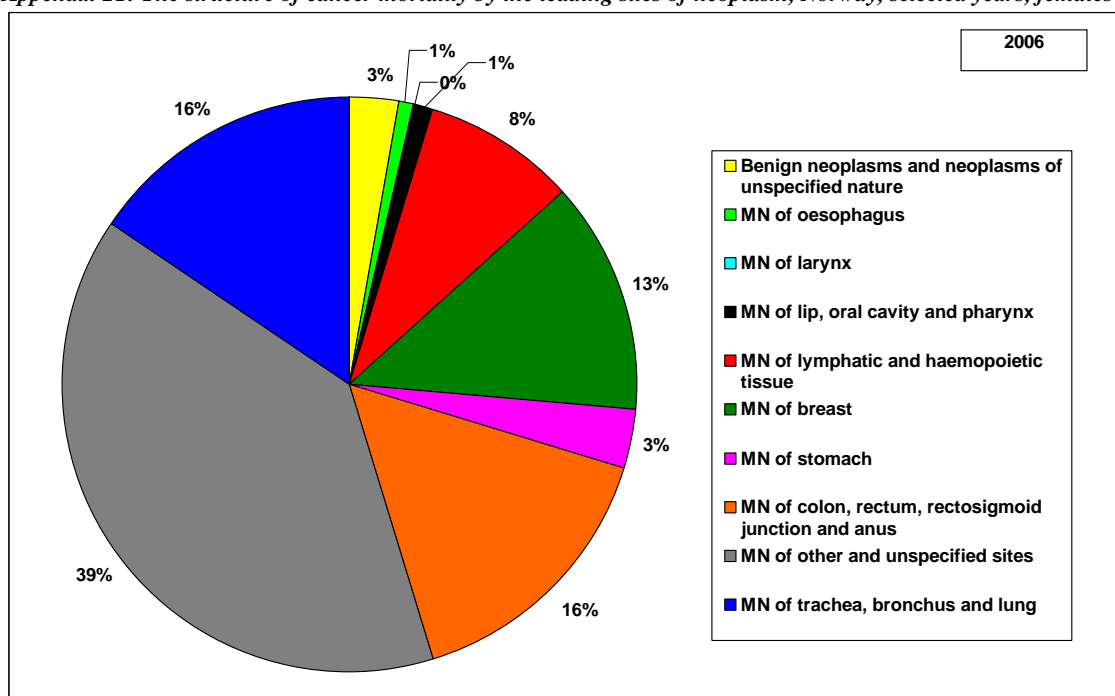


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Appendix 20: The structure of cancer mortality by the leading sites of neoplasm, Norway, selected years, males

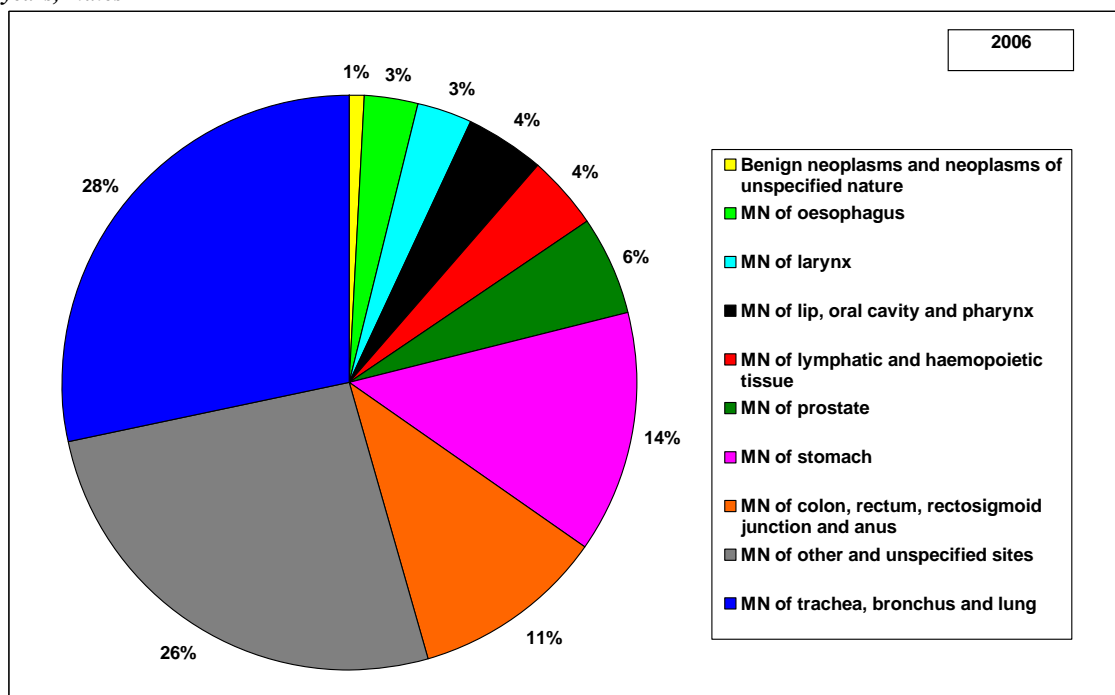


Appendix 21: The structure of cancer mortality by the leading sites of neoplasm, Norway, selected years, females

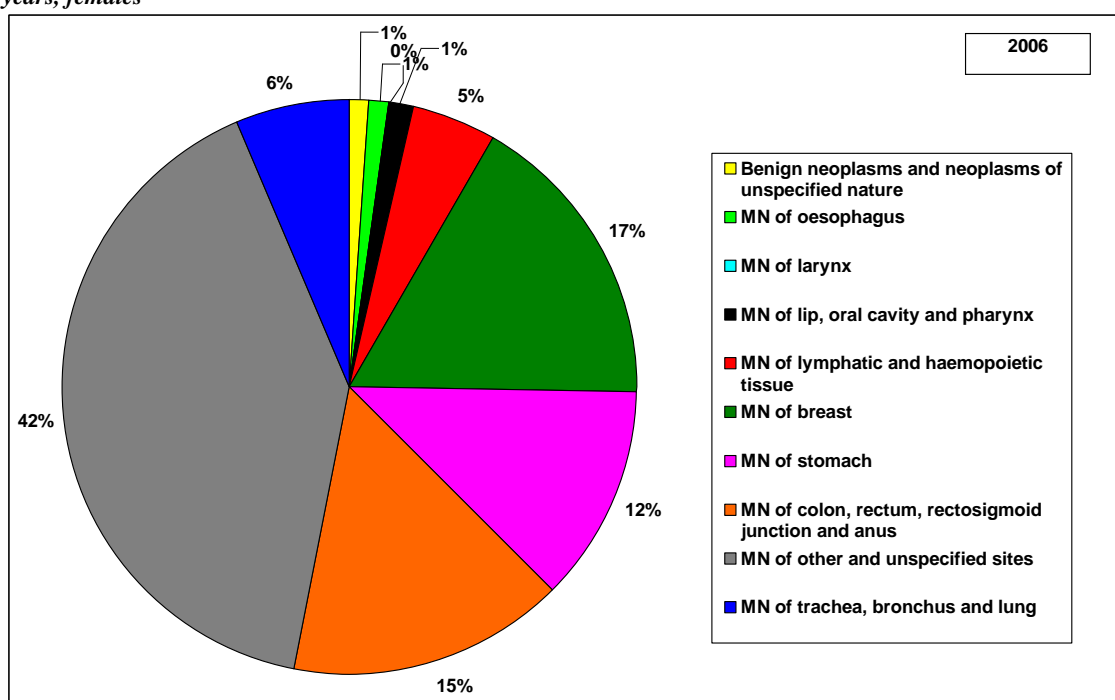


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Appendix 22: The structure of cancer mortality by the leading sites of neoplasm, the Russian Federation, selected years, males

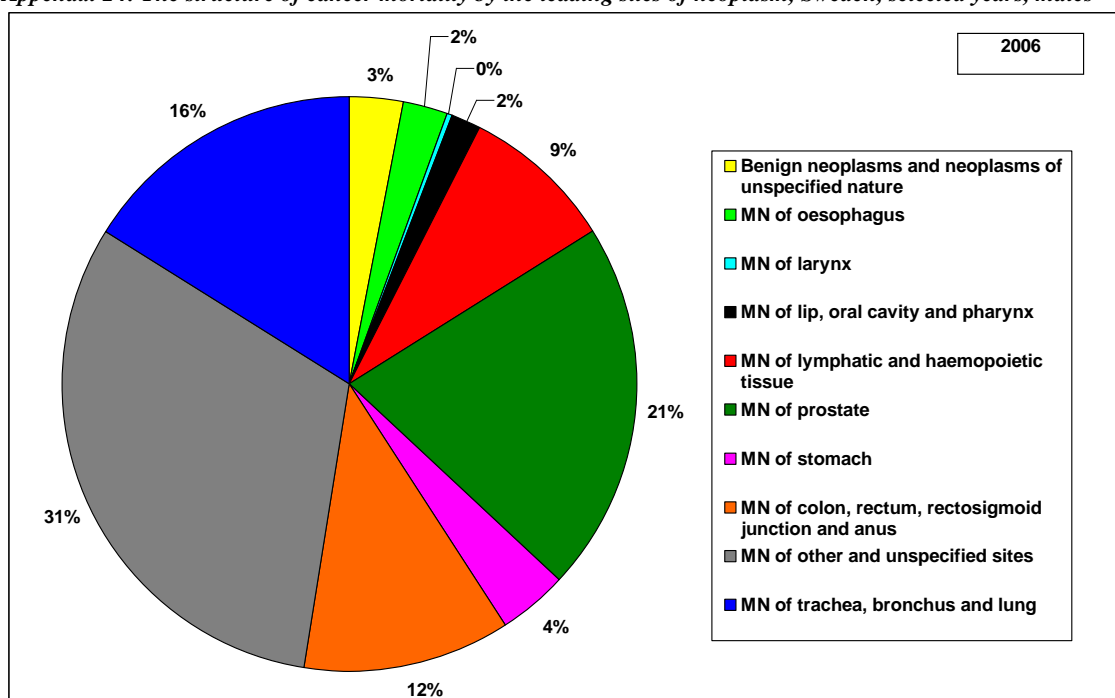


Appendix 23: The structure of cancer mortality by the leading sites of neoplasm, the Russian Federation, selected years, females

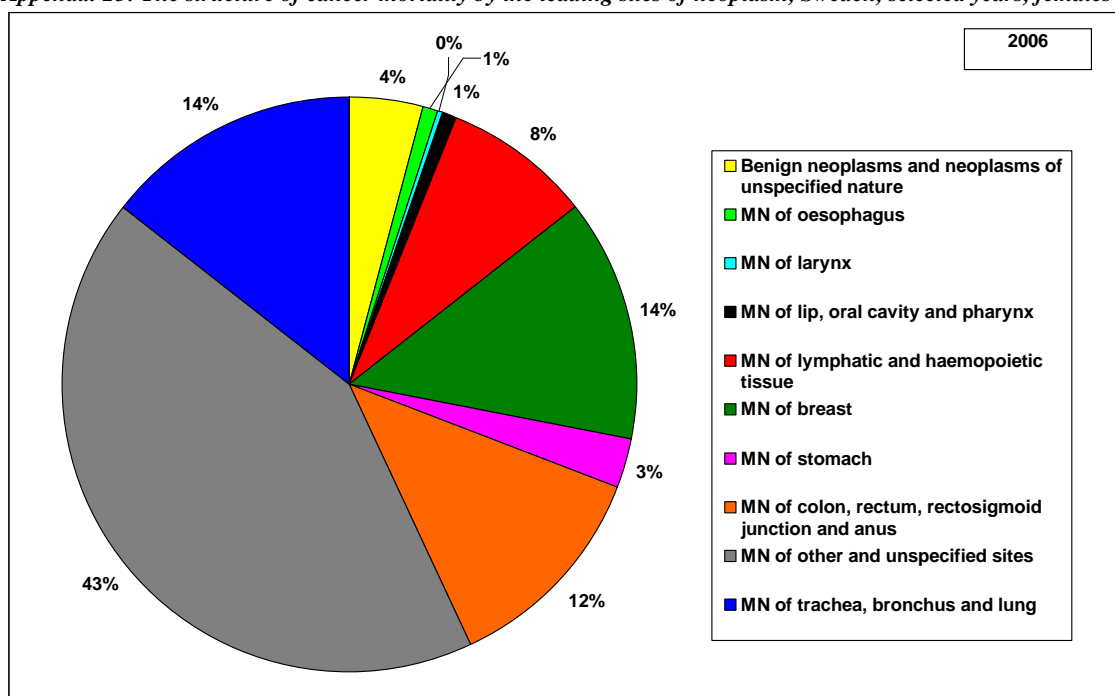


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Appendix 24: The structure of cancer mortality by the leading sites of neoplasm, Sweden, selected years, males



Appendix 25: The structure of cancer mortality by the leading sites of neoplasm, Sweden, selected years, females



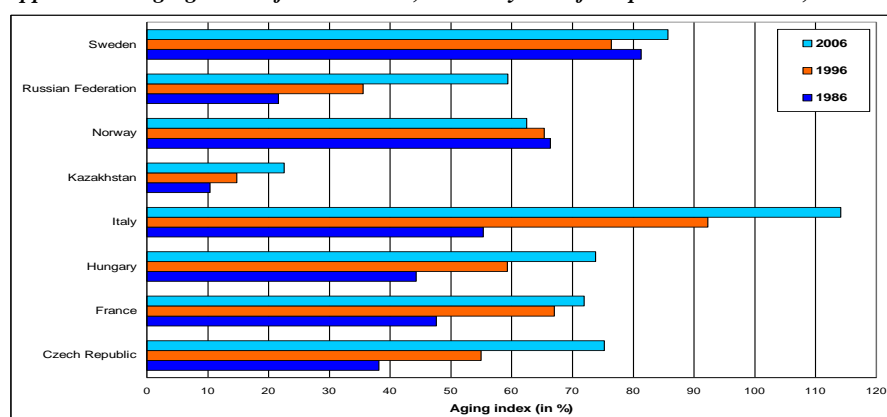
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Appendix 26: The potential years of life lost (YPLL) for selected countries, males, females, 2006

Countries	Causes of death (males)							
	All causes	Infectious	Neoplasm	Circulatory	Respiratory	Digestive	External	Others
Czech Republic	95.4	0.5	27.0	26.2	3.9	7.3	20.8	9.7
France	73.4	1.6	23.9	9.9	1.6	3.8	15.9	16.8
Hungary	150.8	1.0	40.8	43.1	6.0	18.6	26.6	14.8
Italy	58.6	1.6	20.4	11.6	1.4	2.9	11.3	9.4
Kazakhstan	260.7	13.6	18.0	70.2	15.4	14.9	89.1	39.4
Norway	56.3	0.7	14.1	10.6	1.7	1.2	15.1	12.9
Russian Federation	302.5	13.3	27.4	91.0	15.0	16.9	107.5	31.4
Sweden	53.0	0.7	14.1	12.3	1.5	2.2	12.4	9.8

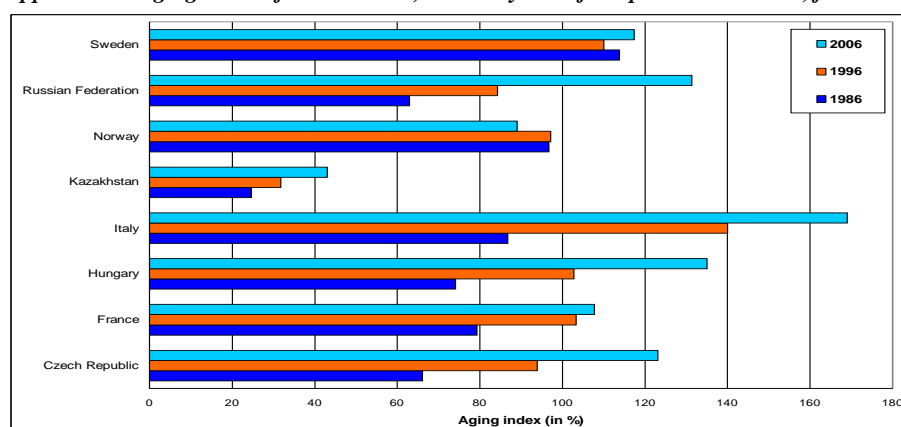
Countries	Causes of death (females)							
	All causes	Infectious	Neoplasm	Circulatory	Respiratory	Digestive	External	Others
Czech Republic	44.9	0.2	18.9	10.5	1.6	3.0	5.1	5.6
France	35.0	0.7	14.4	3.6	0.7	1.5	5.0	8.9
Hungary	67.1	0.3	24.3	17.3	2.8	6.9	6.3	9.2
Italy	30.6	0.7	14.9	4.6	0.6	1.2	2.7	5.9
Kazakhstan	109.9	5.1	15.0	30.2	7.1	6.8	22.6	23.1
Norway	33.6	0.4	14.3	4.1	1.4	0.9	5.1	7.4
Russian Federation	106.5	3.4	18.9	34.5	4.2	8.1	23.3	14.1
Sweden	33.8	0.4	15.0	5.0	1.0	1.1	4.8	6.3

Appendix27: Aging index of all countries, selected years of the period 1986-2006, males



Source: Author's own calculations based on data from WHO mortality database

Appendix28: Aging index of all countries, selected years of the period 1986-2006, females



Source: Author's own calculations based on data from WHO mortality database